VOLUME 46 NUMBER 1, PART I JULY, 1958

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THIRD SERIES FOUNDED BY EDWARD JACKSON

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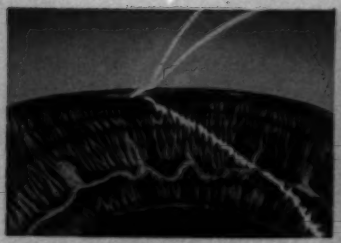

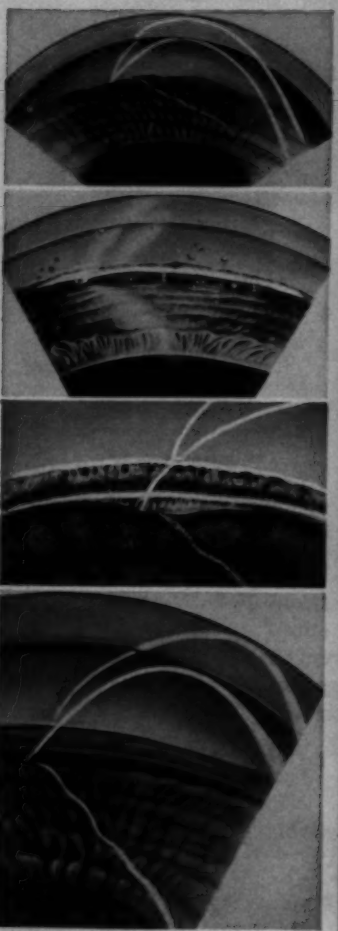

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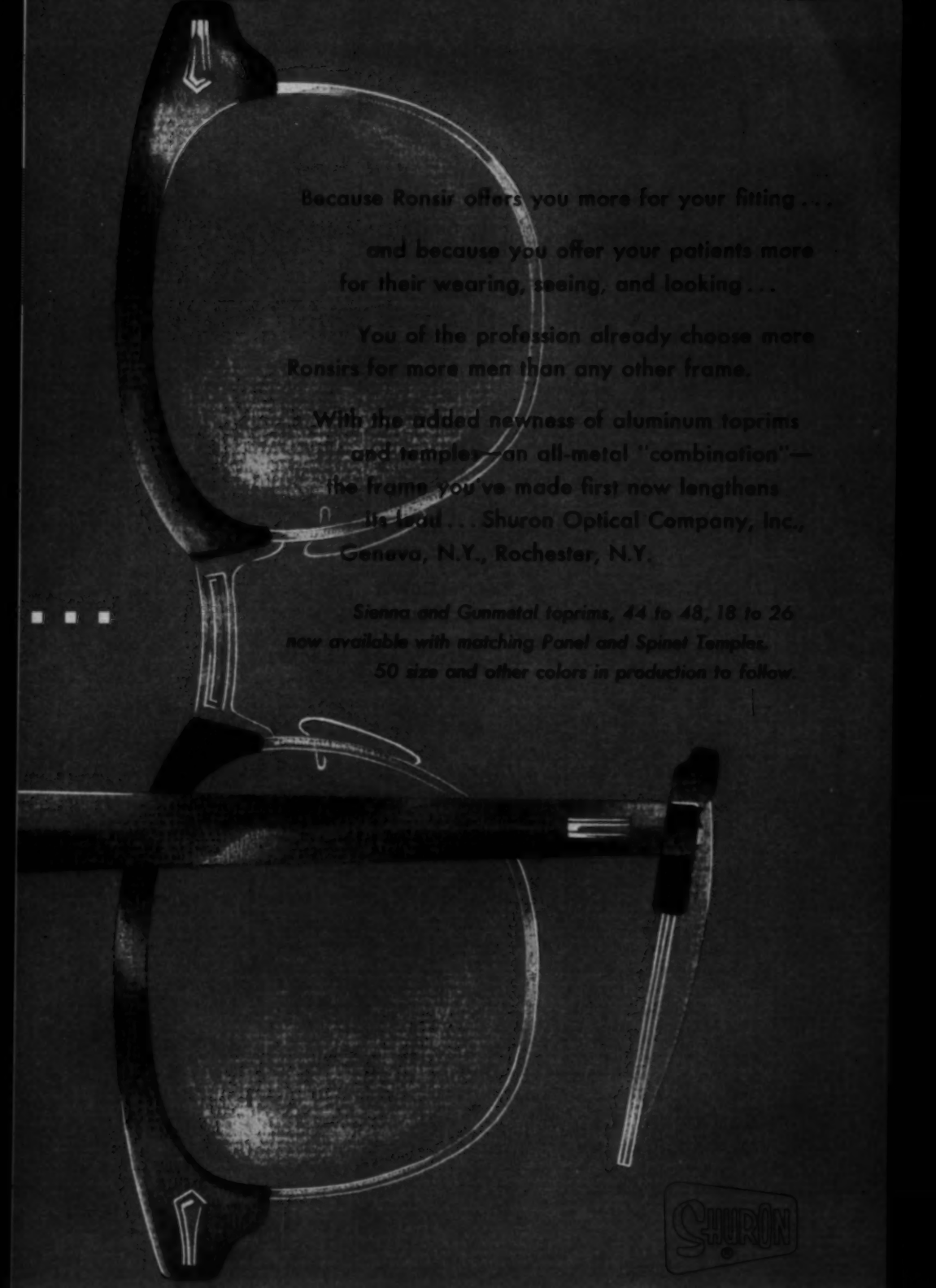
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AMERICAN JOURNAL OF OPHTHALMOLOGY

VOLUME 46 JULY, 1958 NUMBER 1, PART I

FACTORS INFLUENCING THE BLOOD VOLUME OF THE CHOROID AND RETINA*

JEROME W. BETTMAN, M.D., AND VICTOR FELLOWS, M.D.
San Francisco, California

The clinical importance of the choroidal vascular bed in sustaining retinal function is axiomatic. Many disorders of the retina and choroid have been known to be or presumed to be due to impaired blood supply. For decades numerous drugs have been used in an attempt to increase the blood supply of the choroid and retina. In many instances these drugs are completely without effect, in other instances they may actually decrease the intraocular blood volume secondary to dilation of the peripheral vascular bed elsewhere in the body.

Until recently there has been no good method available with which to evaluate the effect of drugs on the choroidal blood volume.

The study of factors influencing the blood supply of the retina or choroid has been the subject of a large number of clinical and experimental investigations. The following outline presents a summary of these investigations:

I. Techniques dependent on direct observation of the vessels of the retina or choroid:

A. Ophthalmoscopic observation, with or without a grid.[13]

Comment. This method has been totally unsatisfactory. It is difficult, if not impossible, to maintain fixation upon a given segment of a vessel for a long period of time. The changes in size are usually too subtle to be detected by direct observation. Varying degrees of astigmatism and aberrations in different sections of the cornea may cause apparent variations in size more marked than those caused by actual alterations in caliber of the blood vessels.

Even if this method were effective, it would only indicate changes in vessels subject to direct observation and would give little information on the total blood volume of the choroid and retina.

B. Photography with a fundus camera.[18, 14]

Comment. If fundus photographs are examined with a dissection microscope with a scale in the ocular some consistent changes can be noted after breathing pure oxygen.[10] This method only permits comparison of given areas of isolated vessels, and much variation in these individual vessels has been found.[21] Other objections to the method are changes in size of the vessels with variations in the pulse phase, variations in the state of focus, distortion at the periphery of the field, and interference due to motion of the patient or animal.

C. Photography of the retinal vessels using a Leitz Ultropak Microscope and a Koeppe Contact lens.

Comment. This method is subject to most of the objections noted under B (vide supra).

D. The scleral window technique of Leopold.

Comment. This interesting and ingenious method provides direct observations under a microscope of the choroidal blood vessels through a sclera window,[15] but only the larger choroidal vessels can be studied. In all of their thorough and extensive investigations Leopold and his co-workers were unable to demonstrate dilatation of the choroidal

* From the Division of Ophthalmology, Department of Surgery, Stanford University Medical School. This study was supported by Research Grant PHS B-687, Department of Health, Education, and Welfare.

blood vessels by any drug.[22] They state that this could be due to experimental conditions (proptosis of the eye, dehydration of the sclera, trauma from insertion of plastic disc in suprachoroidal space, and so forth); or that the absence of response to this type of drug could be due to maximal dilatation that existed from the beginning of the studies.[23]

II. Techniques dependent upon secondary physiologic effects resulting from changes in vascularity.

A. Electroretinography.

Comment. Circulatory disturbances in the retina produce variations in the electrical response, and the shape of the electroretinogram varies in part with alterations in the blood supply.[8, 12] The reliability of this technique for the study of the action of vasodilator drugs has not been established. Henkes rarely uses the electroretinogram for this purpose because of inconsistent results.[9] Hellstrom[7] and Jacobsen and Lincoln[11] found the results variable and the evaluation difficult.

B. Studies of the flicker fusion frequency.

Comment. This technique was used by Scher and Spankus[20] to evaluate vasodilators. The results were not striking.

C. Angioscotometry.

Comment. The effect, if any, is a secondary one and provides an indirect measure of the retinal blood vessels, and only the retinal blood vessels.

D. Intraocular pressure.

Comment. The correlation of vascular events within the eye with changes in the intraocular pressure is very difficult to achieve since many other influences must be eliminated.

General comments on methods of studying intraocular circulation

A perusal of the foregoing summary of available methods for the study of the intraocular circulation discloses only one technique which readily lends itself to the study of the choroidal blood supply: the scleral window technique of Leopold. This technique failed to reveal any drug or agent which increased the diameter of the choroidal vessels.

A new technique which we have previously described[2] is the only one that permits the study of changes in the total blood volume of the choroid and retina. The associated experimental trauma is minimal.

In brief, this technique adapted from Berson and Yalow[1] is:

Radioactive phosphorus (P^{32}) is incubated with 10 cc. of blood previously withdrawn from an experimental animal. This causes the P^{32} to enter into the red blood cells where it is confined for a number of hours. The red cells are then centrifuged, washed three times, resuspended in saline and reinjected into the animal. Thus, any P^{32} that did not enter the red cells is washed away. All of this radioactivity is contained in the red blood cells which, in turn, are confined to the vascular tree. As the P^{32} is equally distributed throughout the vascular tree in a very short time, and increase in radioactivity means that a greater volume of blood is present under the counting tube. A decrease in radioactivity indicates the reverse.

The basis of this technique is illustrated in the accompanying illustrations. If the P^{32} is not incubated into the red cells it soon diffuses out of the blood vessel (fig. 1). However, if the P^{32} is incubated into the red cells, all of the radioactivity is confined within the blood vessel (fig. 2). If a Geiger-

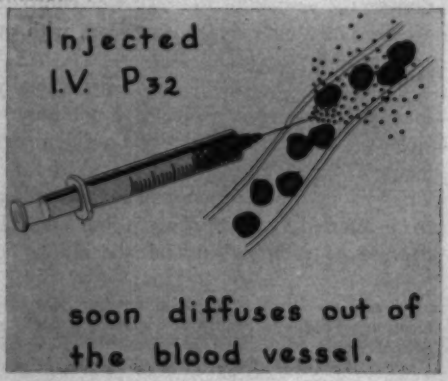


Fig. 1 (Bettman and Fellows).

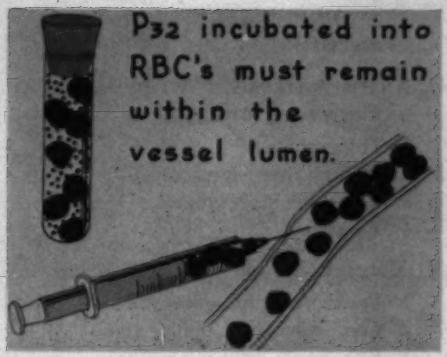


Fig. 2 (Bettman and Fellows).

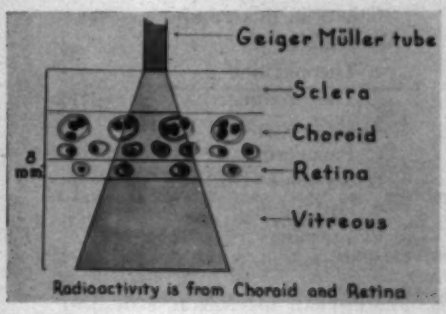


Fig. 3 (Bettman and Fellows).

Muller tube is placed over the sclera it detects the radioactivity in the blood vessels immediately below it. P^{32} emits only beta particles which travel a maximum of eight mm. through tissue. If the conjunctiva is removed, a Geiger-Muller tube placed over the sclera, posterior to the ora serrata, could only receive impulses from the following tissues: the sclera which contains a negligible volume of blood; the choroid which contains most of the blood; the retina with some blood; and the vitreous which contains none (fig. 3). As most of the blood is in the choroid, and some in the retina the radioactivity is derived from these structures. If the volume of blood in these structures is increased, more radioactivity will be detected by the Geiger-Muller tube (fig. 4).

The technique, therefore, enables the investigator to detect changes in the blood volume of the choroid and retina, and to evaluate agents that may alter the blood volume. It must be emphasized that the technique used here gives no indication of the rate of blood flow, only changes in the volume of blood.

A systematic study of drugs and mechanical agents that might increase the blood volume of the choroid and retina has been undertaken. It was not considered practical to investigate all drugs and agents that might influence the blood volume, but representatives of most groups of drugs and agents have been investigated. These are indicated in the following outline, which does not include every drug in each group. Drugs listed as "others in this group" were not studied.

Groups of drugs and agents under study

A. Direct depressants of vascular smooth muscle

1. Nitrites
   a. Amyl nitrite
   b. Sodium nitrite

   Others in this group
   c. Glyceryl trinitrate
   d. Erythrityl tetranitrate
   e. Mannitol Hexanitrate
   f. Ethyl Nitrite
   g. Penaerythritol tetranitrate
2. Xanthines
   a. Aminophyllin

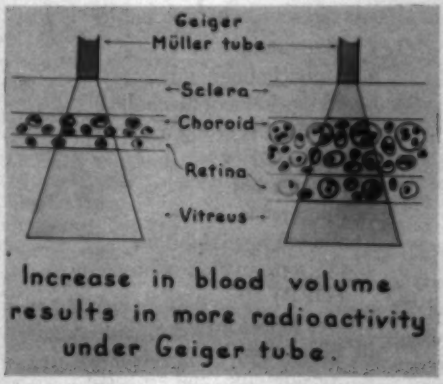


Fig. 4 (Bettman and Fellows).

Others in this group
b. Caffeine
c. Theophylline
d. Theobromine
3. Miscellaneous
a. Papaverine
b. Nicotinic acid
c. Histamine
d. Procaine
e. Carbon dioxide

B. Peripheral adrenergic blocking agents
1. Tolazoline (Priscol)
2. Phentolamine (Regitine)
3. Benzodioxanes
Others in this group
a. Yohimbine
b. Azapeline (Ildar)
4. Dibenamine, dibenzyline, and related compounds

C. Autonomic ganglion blocking agents
1. Nicotine
2. Hexamethonium
Others in this group
a. Tetraethylammonium
b. Pentamethonium

D. Centrally acting sympathetic inhibitors
1. Dihydroergotamine (*also* peripheral adrenergic blocking agent and direct vasoconstrictor)

E. Parasympathomimetic drugs
1. Choline esters
a. Acelylcholine
b. Methacholine (Mecholyl)
Others in this group
c. Carbachol
d. Bethanechol
e. Pilocarpine
2. Cholinesterage inhibitors
a. Di-isopropylflourophosphate (DFP)
Others in this group
b. Physostigmine
c. Neostigmine, and so forth

F. Sympathomimetic drug
Epinephrine

G. Antihypertensives with mixed or unknown actions
1. Thiocyanates
2. Hydralazine (apresoline)
3. Rauwolfia serpentina
4. Veratrum

H. Mechanical or surgical procedures
1. Paracentesis of aqueous
2. Compression of jugular veins
3. Exhalation against pressure
4. Cervical sympathectomy
5. Cold to extremities
6. Heat and cold locally

I. Tobacco smoke

The experimental animals used in all but the earliest experiments were cats. It was felt that these animals exhibited an intraocular circulation, carotid-sinus reflex, and other features more similar to man than did rabbits or other experimental animals readily available.[16] A total of 170 animals was used.

Drugs which acted peripherally had little effect on the intraocular blood volume when given by systemic administration, but a marked effect when administered by retrobulbar injection. These included the direct depressants of vascular smooth muscle under A in the outline first presented and the peripheral adrenergic blocking agents under B.

The following discussion of the results of our experiments follows the outline already given.

Discussion

Sodium nitrite administered intravenously produced no change in the intraocular blood volume (five animals). Amyl nitrate pearl given by inhalation resulted in an immediate decrease in blood volume followed by a transient increase (five animals) (fig. 5). This effect was probably a passive result secondary to the opposite effect on the peripheral circulation. It was not sufficiently prolonged, or sufficiently marked, to suggest real clinical

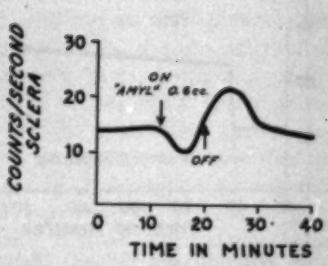


Fig. 5 (Bettman and Fellows). Inhalation of amyl nitrite (0.3 cc. pearls) caused a transient decrease in blood volume (possibly secondary to dilation elsewhere) followed by a transient increase.

value. The nitrites do not lend themselves to retrobulbar administration.

Aminophyllin was studied as a representative of the xanthines. When given by intravenous injection (four animals) almost no effect was obtained (fig. 6). However, when this drug was given by the retrobulbar route (four animals), a marked and prolonged increase in the intraocular blood volume occurred (fig. 7).

A control injection of one cc. of saline given retrobulbarly produced no effect (fig. 8). When a greater volume of saline was injected behind the globe, a decrease in the blood volume resulted (fig. 9). This was, in all probability, simply due to mechanical compression of the vessels. The same effect could be obtained by applying pressure to the globe externally (fig. 10).

Among the drugs listed in the miscellaneous group, nicotinic acid was noteworthy in having no effect whatsoever when given intravenously (six animals) (fig. 11). Nicotinic acid by retrobulbar administration did increase the blood volume (five animals) but

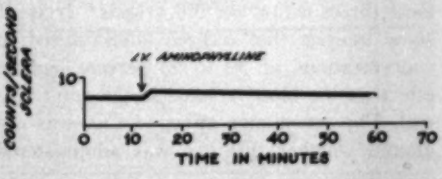


Fig. 6 (Bettman and Fellows). Aminophylline (50 mg./2.0 cc.) given intravenously produced no significant effect.

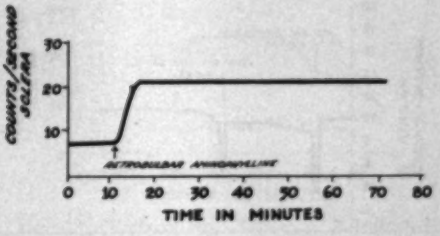


Fig. 7 (Bettman and Fellows). Aminophylline (25 mg./1.0 cc.) given by the retrobulbar route produced a marked and prolonged increase in blood volume.

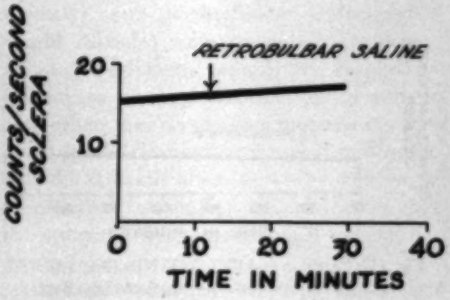


Fig. 8 (Bettman and Fellows). Saline (1.0 cc.) by retrobulbar injection produced no effect.

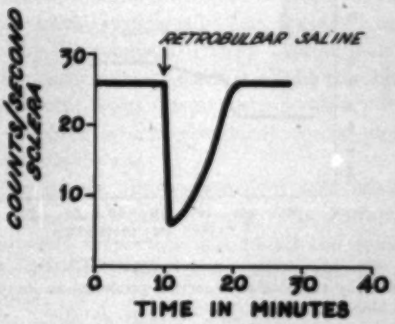


Fig. 9 (Bettman and Fellows). Saline (2.0 cc.) by retrobulbar injection produced a decrease in blood volume.

not as much as did aminophyllin (fig. 12).

The action of histamine changes as one ascends the zoologic scale. In cats a slight arteriolar constriction occurs.[5] In our experiments the retrobulbar injection of histamine decrease the blood volume, but it is improb-

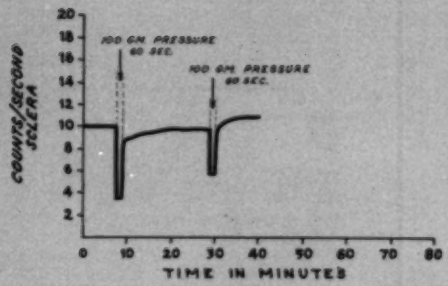


Fig. 10 (Bettman and Fellows). Pressure applied externally to the eyeball decreased intraocular blood volume.

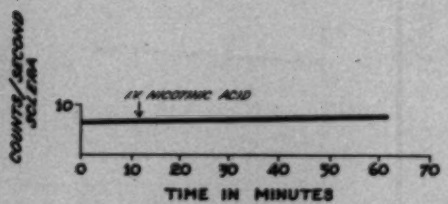


Fig. 11 (Bettman and Fellows). Nicotinic acid (50 mg.) given intravenously produced no effect.

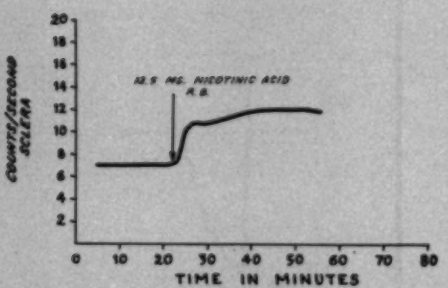
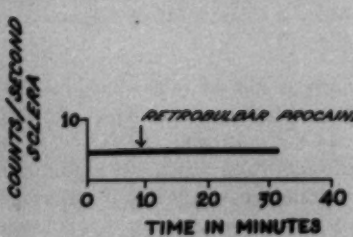


Fig. 12 (Bettman and Fellows). Nicotinic acid given by retrobulbar injection produced an increase in blood volume.



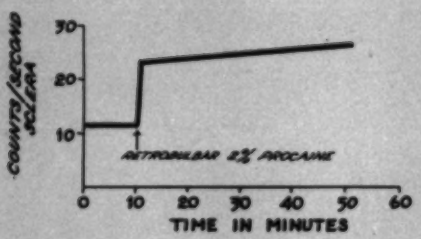


Fig. 14 (Bettman and Fellows). Retrobulbar procaine hydrochloride (two percent, 2.0 cc.) in larger doses produced an increase in blood volume.

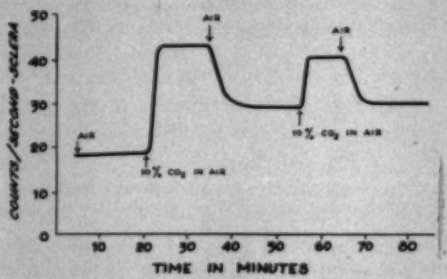


Fig. 15 (Bettman and Fellows). Carbon dioxide (10 percent in air) produced a definite increase in blood volume.

able that the same effect would be obtained in humans.

Procaine by retrobulbar administration produced no effect when given in small doses, for example 0.5 cc. of 1.0-percent solution (fig. 13). It produced a definite increase in blood volume when given in large doses, for example 2.0 cc. of 2.0-percent solution (fig. 14).

Carbon dioxide was one of the best vasodilators we encountered. When administered in concentration of eight or 10 percent in air, it produced a marked and consistent effect (fig. 15). The vasodilation is caused by a local direct action on the vessels.[6] It is of some interest that oxygen administered in concentrations of 50 to 90 percent had no effect on the blood volume in the adult animal. The vasodilator effect of CO_2 was not altered whether this gas was administered

←Fig. 13 (Bettman and Fellows). Retrobulbar procaine hydrochloride (one percent, 0.5 cc.) in small doses produced no effect.

mixed with air, or with pure oxygen (20 animals). This is of some practical clinical importance in cases of occlusion of the central artery of the retina. One may wish to administer the combination of these gases in order to attain the vasodilator effect of CO_2 while giving O_2 to support the anoxic retina by diffusion from the choroid as suggested by Patz.[17] It is of importance to know that oxygen does not constrict the adult vessels or diminish the effect of CO_2.

Among the peripheral adrenergic blocking agents (group B in the outline) Tolazoline (Priscoline®) was the drug most thoroughly studied. Tolazoline when given by the intravenous route caused a slight decrease in intraocular blood volume (probably secondary to peripheral dilation (fig. 16). The same drug given retrobulbarly caused a definite increase in blood volume (fig. 17).

The autonomic ganglion blocking agents (group C in the outline) are exemplified by hexamethonium (four animals). This drug produced no change when given intravenously while the animal was flat. When the hand was lowered the intraocular blood volume was increased, when it was raised the reverse occurred. Nicotine, which may be classified with this group, had better be discussed under the last heading—tobacco smoking.

Dihydroergotamine was used as an example of the centrally acting sympathetic inhibitors (group D in outline). It caused slight decrease in the intraocular blood volume, probably as a result of peripheral vasodilation (three animals).

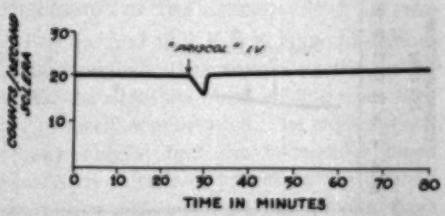


Fig. 16 (Bettman and Fellows). Intravenous tolazoline hydrochloride (Priscoline, 12.5 mg.) produced no significant effect.

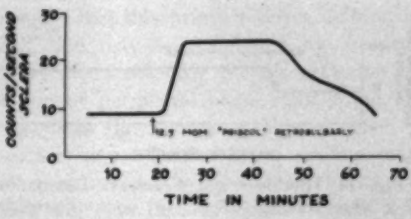


Fig. 17 (Bettman and Fellows). Retrobulbar tolazoline hydrochloride (Priscoline) produced a definite increase in blood volume.

Parasympathomimetic drugs (group E in outline) exemplified by acetylcholine (four animals) and methacholine (Mecholyl®) (eight animals) were studied. These drugs, although peripheral vasodilators, resulted in a decrease in the intraocular blood volume both when they were given systemically and given by the retrobulbar route. It is possible that the systemic absorption was sufficiently great after retrobulbar administration that the systemic effect predominated causing decreased intraocular blood volume. The marked salviation that occurred was a sign of this systemic effect.

The sympathomimetic drug epinephrine produced a definite increase in blood volume when given systemically (six animals) and also by the retrobulbar route (six animals). It is possible that the action of the retrobulbar injection was due to systemic absorption of the drug which secondarily forced more blood into the eye.

Among the antihypertensives with mixed or unknown actions (group G in outline), Rauwolfia serpentina was tested and found to be devoid of effect on the intraocular blood volume.

In group H, the effect of paracentesis was of some interest. As might be expected removal of aqueous resulted in a definite increase in intraocular blood volume. If a large quantity of aqueous (0.8cc.) was removed the increase in blood volume persisted for a long while (fig. 18) (three animals). If a smaller quantity (0.2 cc.) was removed, the increase was of the same magnitude but did not last as long (fig. 19) (three animals). In order

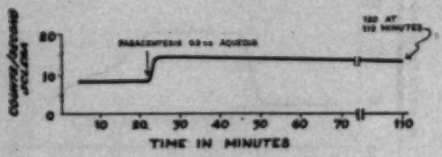


Fig. 18 (Bettman and Fellows). Paracentesis of a large volume (0.8 cc.) of aqueous produced definite and prolonged increase in blood volume.

to diminish the magnitude of increase in blood volume it was necessary to remove the tiniest bit of aqueous (estimated 0.05) (fig. 20) (three animals). This would suggest that one should drain as much aqueous as possible if one wished to dilate blood vessels and have a prolonged effect, as in treating an occlusion of the retinal artery. The experiments further suggest that a decompression of an eye that is to avoid sudden vasodilation must be performed with the smallest possible paracentesis—allowing as little aqueous to escape as can be done.

We were unable to demonstrate the cervical sympathectomy produced any alteration of the intraocular blood volume (four animals). Local external heat to the eye in the form of hot compresses to almost the entire side of the face likewise had no effect (four animals). This was also true of cold compresses (four animals).

The application of ice water to one limb did produce a significant increase in blood volume in the eye in some animals. The susceptibility seemed to vary—three animals showed a very significant increase and five showed little or no response.

The effect of smoking tobacco (cigarettes) was especially interesting. The cigarette was smoked through the inhalation tube on the breathing machine. If it was smoked very rapidly a significant and consistent rise in the intraocular blood volume resulted (fig. 21). If the cigarette was smoked slowly, no change occurred (fig. 22) (10 animals). The rate of smoking changes the composition of the smoke.[3] It is probable that this effect was due to a sufficient dose of nicotine being absorbed rather than other ingredients in the

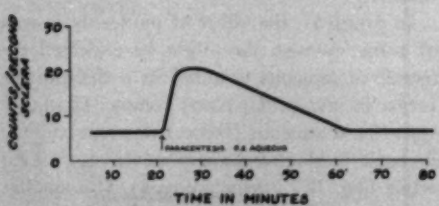


Fig. 19 (Bettman and Fellows). Paracentesis of a smaller volume (0.2 cc.) of aqueous produced a definite but less prolonged increase in blood volume.

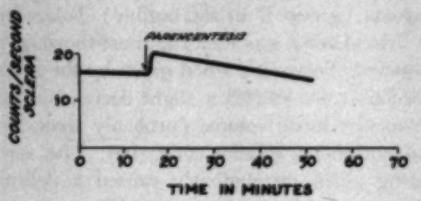


Fig. 20 (Bettman and Fellows). Paracentesis of a minimal volume (0.05 cc.) of aqueous produced a smaller increase in blood volume.

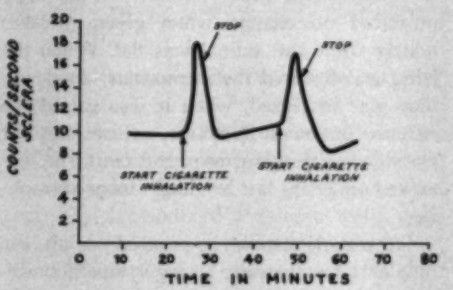


Fig. 21 (Bettman and Fellows). Very rapid cigarette smoking produced a consistent increase in blood volume.

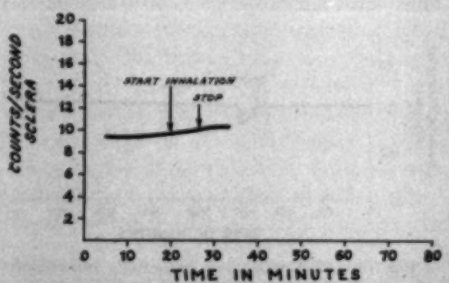


Fig. 22 (Bettman and Fellows). Slow cigarette smoking produced no change in blood volume.

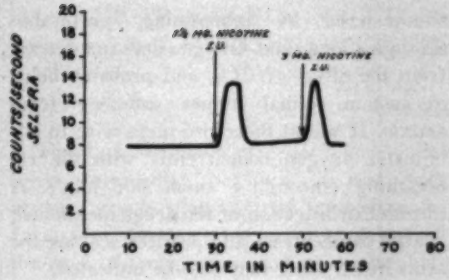


Fig. 23 (Bettman and Fellows). Intravenous injection of nicotine produced the same increase in blood volume as rapid cigarette smoking.

smoke. We were able to demonstrate the same effect from the intravenous injection of a solution of nicotine (eight animals) (fig. 23). The peripheral vasoconstriction associated with cigarette smoking is due to the nictotine.[4,19] It is probable that the increase in blood volume within the eye is secondary to the peripheral vasoconstriction, and in this sense is a passive dilation.

One must be cautious in transferring these findings to patients because the smoking rate was much more rapid, in addition to the usual fact that these are experimental animals and not human beings. However, the possible objection that these animals have not smoked before is probably irrelevant since it has been demonstrated that acquired tolerance to the vasomotor effect of tobacco does not occur.[23]

It is disappointing to report that the intravenous injection of ethyl alcohol had no effect on the intraocular blood volume (four animals).

Discussion of the experimental results

For the first time it is possible to demonstrate definitely that certain agents do increase the choroidal blood volume when they are properly administered. The experimental results suggest that the intraocular blood vessels are capable of primary active dilation since increased blood volume results from the local (retrobulbar) administration of certain drugs with peripheral actions, and after the administration of CO^2. It is suggested, however, that this primary active dilation is weak, and may be dominated by the secondary effect resulting from contraction or dilation of peripheral blood vessels and alterations in blood pressure. The increase or decrease in intraocular blood volume may well be determined by a balance between the direct effect on the intraocular vessels and the secondary effect from the peripheral circulation. The net action of any drug or agent depends on which of these actions predominates. This, in turn, depends on whether the agent acts peripherally or centrally and the route of administration.

The foregoing experimental work suggests the following practical classification:

I. Agents with a peripheral action
- A. Drugs that cannot readily be administered locally. These have little effect when given systemically. Example: Nitrites.
- B. Those that can be administered locally and whose action is predominantly local. These drugs have a marked effect when administered by retrobulbar injection, but little or none when given systemically. Examples: Tolazoline (Priscoline) or aminophylline.
- C. Those whose action seems to be predominantly systemic, even after local administration. These have the opposite effect on the intraocular circulation than their generally accepted one. Examples: Epinephrin Mecholyl.

II. Agents with little or no peripheral action
- A. These either had no effect. Example: Hexamethonium (without tilting).
- B. Or the effect is secondary to systemic effects of the drug.
  Example: Nicotine. Such effects usually preclude clinical use of the drug.

III. Agents which mechanically alter the intraocular blood volume
- A. Pressure—retrobulbar or anterior.
- B. Paracentesis.

IV. Reflex

A. Cold pressor.

The experimental work which we have presented suggests the following practical considerations that might be applied to humans: only CO_2 systemically, certain drugs by retrobulbar injection (especially Tolazoline and aminophylline), paracentesis, and possibly cold to the extremities are reasonably safe and effective in increasing the intraocular blood volume. CO_2 is most safely administered by rebreathing, preferably through a long tube. Oxygen does not detract from the effect of CO_2, and probably helps to sustain retinal tissues suffering from anoxia. It would therefore seem wise to administer oxygen concurrently with the rebreathing (through a small side tube). A retrobulbar injection of the drugs mentioned, a large paracentesis, and possibly soaking the arms in ice water may also be indicated.

2400 Clay Street (15).

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THE PROGNOSTIC VALUE OF TONOGRAPHY IN THE MIOTIC THERAPY OF CHRONIC SIMPLE GLAUCOMA*

BERNARD BECKER, M.D.
Saint Louis, Missouri

There is abundant evidence that miotics lower intraocular pressure in eyes with chronic simple glaucoma by improving the facility of aqueous outflow.[1,2] However, at the time of tonography, eyes on miotic therapy may have an intraocular pressure within normal limits in spite of persistently decreased outflow facility. These findings resemble those recorded not infrequently in untreated chronic simple glaucoma. It has been the impression of workers in a number of tonography laboratories that eyes with normalized outflow facility have a better prognosis for pressure control and retention of visual field than do those with reduced facility in spite of miotic therapy.[3,4] However, documentary evidence for this thesis requires a long-term follow up and comparison of a group of eyes in each category. It is the purpose of the present study to review such a series of eyes having chronic simple glaucoma with "pressure normalized on miotic therapy" and followed for a period of at least three years. Such a study permits an evaluation of the prognostic significance of various levels of intraocular pressure and outflow facility on miotic therapy.

METHODS

Tonography was carried out with an electronic tonometer connected to a Leeds and Northrup recorder. All tracings were interpreted on the basis of the 1955 Friedenwald tables[5] with suitable correction for episcleral venous pressure and scleral rigidity.[6]

A series of eyes with an established diagnosis of chronic simple glaucoma were selected from the 1954 files of the Washington University Tonography Laboratory on the basis of "successful pressure control" on miotic therapy. None of these eyes had been subjected to operative procedures and none were receiving agents which suppress secretion of aqueous humor. Pressure control was arbitrarily defined as a reading of 24 mm. Hg or less at the initial tonogram (scale reading 3.0 or more with a 5.5-gm. weight). The three years of follow-up included repeated tonometry, tonography, ophthalmoscopy, and visual fields at frequent intervals. A total of 250 eyes fulfilled all the criteria including adequate follow-up data.

RESULTS

For purposes of the present study, continued successful glaucoma control was defined as a pressure of 24 mm. Hg or less at all subsequent measurements over the period of three years and no progression of field loss on continued miotic therapy. Any eye that had a recorded pressure greater than 24 mm. Hg, that lost visual field, or that required secretory inhibitors or surgery was classified as a failure.

Out of the 250 eyes in this series, 135 (54 percent) were controlled successfully on miotics alone for over three years, and 115 eyes (46 percent) required supplementary or different therapy. A comparison of the initial findings in the two groups of eyes is presented in Table 1. It is apparent that these two populations differ significantly as to various measures of status of control. Thus, although all of the eyes in this series were selected as having an initial pressure of 24

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TABLE 1

COMPARISON OF INITIAL TONOGRAPHIC FINDINGS IN CHRONIC SIMPLE GLAUCOMA CONTROLLED AND UNCONTROLLED ON MIOTICS

Initial Tonographic Criteria	Controlled*	Uncontrolled
	(No. Eyes)	(No. Eyes)
Total number eyes ($P_o \leq 24$ mm. Hg)	135 (100%)	115 (100%)
$P_o < 20$ mm. Hg	100 (74%)	36 (31%)
$C > 0.15$	111 (82%)	25 (22%)
$P_o/C < 100$	105 (78%)	10 (9%)
Mean P_o (±S.D.)	18.2 (±2.1)	20.1 (±2.4)
Mean C (±S.D.)	0.223 (±0.056)	0.130 (±0.059)

P_o = intraocular pressure.
C = outflow facility.
* Control defined as no pressure rises to over 24 mm. Hg and no loss visual field on miotic therapy for over three years.

mm. Hg or less, 74 percent of the eyes in the successfully controlled group had pressures less than 20 mm. Hg, and only 31 percent of the uncontrolled group fell into this pressure category. The two populations present a marked difference in the distribution of outflow facility at the beginning of the study. This is demonstrated graphically in Figure 1. Statistically there is a significant difference in pressure values and an even greater difference in facility values between the controlled and uncontrolled groups of eyes. In attempting to combine these two variables into one expression the P_o/C value may be utilized, much as is done in glaucoma diagnosis.[7,8] A P_o/C of less than 100 characterized 78 percent of the controlled eyes but only nine percent of the uncontrolled.

The same data may also be analyzed in such fashion as to permit an evaluation of the prognostic significance for particular initial values of intraocular pressure and outflow facility. In Table 2 the percent of eyes controlled successfully is compared for a number of initial tonographic findings. Thus although pressure control on miotics at a level of 24 mm. Hg or less predicts continued control for over three years in approximately one-half of glaucomatous eyes, pressures less than 20 mm. Hg suggest similar control in approximately three fourths of such eyes. Facilities of outflow greater than 0.10 assure successful control to two-thirds of eyes presenting this as their initial values. Facility values of greater than 0.15 raise the chances of success to four out of five, and outflow coefficients greater than 0.20 increase this still further, to approximately nine out of 10 eyes in this series.

In the group of eyes studied, the use of the ratio P_o/C provides one of the best means of anticipating the status of control over the three year period (table 3). Thus, a P_o/C value of less than 100 results in successful control in 91 percent of eyes, whereas a P_o/C greater than or equal to 100 predicts continued control in only 22 percent.

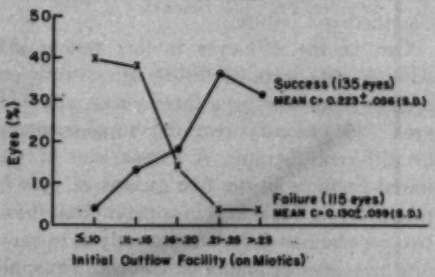

Fig. 1 (Becker). Distribution of initial outflow facilities in controlled and uncontrolled chronic simple glaucoma treated with miotics.

TABLE 2

PROGNOSTIC SIGNIFICANCE OF TONOGRAPHIC VALUES ON MIOTIC THERAPY

Initial Tonographic Criteria	No. Eyes	No. Successfully Controlled*
$P_o \leq 24$ mm. Hg	250	135 (54%)
$P_o < 20$ mm. Hg	136	100 (74%)
$C > 0.10$	198	129 (65%)
$C > 0.15$	136	111 (82%)
$C > 0.20$	96	87 (91%)
$P_o/C < 100$	115	105 (91%)

P_o = intraocular pressure.
C = outflow facility.
* Successful control defined as no pressure rises to over 24 mm. Hg and no loss visual field on miotic therapy for over three years.

TABLE 3

THE USE OF THE RATIO P_0/C IN THE PROGNOSIS OF CHRONIC SIMPLE GLAUCOMA TREATED WITH MIOTICS

	No. Eyes	No. Successfully Controlled*
$P_0/C \geq 100$	135	30 (22%)
$P_0/C < 100$	115	105 (91%)
Total	250	135 (54%)

* Successful control defined as no pressure rises to over 24 mm. Hg and no loss visual field on miotic therapy for over three years.

Discussion

Although many ophthalmologists accept a tonometer reading of 24 mm. Hg or less (scale reading 3.0 or more with a 5.5 gm. weight) as adequate miotic control of chronic simple glaucoma, the results in the present series suggest that a safer pressure level would be below 20 mm. Hg. From the eyes studied, this permits a prediction of a three to one chance for continued control.

As might be anticipated, normalization of outflow facility provides one of the best buffers against rises of intraocular pressure and glaucoma damage. Conversely, inadequate normalization of outflow facility significantly decreases the chances for continued control. Such eyes demand closer follow up, attempts at more intensive miotic therapy, and perhaps the use of secretory suppressants such as epinephrine or carbonic anhydrase inhibitors.

The empirical ratio P_0/C provides a convenient method for predicting control when reading tonograms. It tends to take into account the outflow facility for a given secretory level. By so doing, it permits estimating prognosis more accurately even in eyes in which hyposecretion maintains control of pressure in spite of markedly impaired outflow facility.

The present series is open to criticism because arbitrary standards for successful control have been used. Furthermore, comparison is made only with the initial tonographic findings on therapy. It is certainly true that some eyes with normalized pressure and facility values when first seen, subsequently developed further progression of the outflow defect with resultant loss of control. These are classified as failures in the present series in spite of the normalized initial values. On the other hand, there is a large element of chance involved in whether or not an elevated pressure reading has been recorded. Most important, although the degree of control appears to correlate with the outflow facility coefficient in a series of eyes, the variation in the vulnerability of the optic nerve to a given level of intraocular pressure makes the tonographic findings only suggestive for the individual eye. The ultimate satisfactory status of control for a given eye with glaucoma must be defined in terms of lack of progression of damage to the optic nerve and the maintenance of visual field. In our present state of knowledge, however, tonography appears to afford valuable statistical prognostic information. In the individual case, although a persistence of decreased outflow facility on miotic therapy is not in itself an indication for surgery, it should serve as a warning signal for closer follow up and more intensive medical therapy.

Summary and Conclusions

In eyes with chronic simple glaucoma, tonography provides useful supplementary data to pressure measurements in the evaluation of the status of control on miotic therapy. Normalization of outflow facility by miotics is excellent insurance for continued successful control.

640 South Kingshighway (10)

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CHOROIDAL METASTASES FROM CARCINOMA OF THE BREAST*

ROBERT J. DICKSON,† M.D.
Baltimore, Maryland

Metastatic intraocular tumors are reputedly rare but there is general agreement that the breast is the primary site of the malignant disease in the majority of cases that have been recorded.[15] Thus, Cohen[3] and Merriam[10] state that 70 percent of the cases reported in the literature were metastatic from the breast and Willis[17] reports that the responsible primary tumor in 140 cases was in the breast in 78 percent. Other tumors which have been reported to metastasize to the intraocular structures include the lung,[6] kidney, and stomach; and isolated instances have been recorded from the liver, esophagus, testicle, rectum, prostate, adrenals, ovary, parotid, and mouth. At Johns Hopkins Hospital within a period of three years, seven cases of choroidal tumors thought to be metastatic from carcinoma of the breast have been seen in the Radiotherapy Department and it seems at least possible that this site is not as infrequent as the number of annotated cases would suggest.

INCIDENCE

Bedell[1] collected 250 cases of choroidal metastases from the literature and gave as his opinion that "few ophthalmologists ever encounter more than one case in their private practice." Schinz[14] noted the occurrence of intraocular metastases in three out of 536 cases of breast carcinoma. Godtfredsen[7] estimated the incidence to be 1.5 per thousand cases of breast carcinoma but he is in disagreement with other authors in believing that the lung and the testicle may be equally common as sites for the primary lesion. Lederman,[8] in a series of 168 cases of malignant tumors of the eye, included 10 metastatic tumors, three of which were from the breast.

The true incidence of this metastasis is difficult to determine. It may be that clinicians are more cognizant of the possible connection between mammary carcinoma and visual disturbances, that co-operation between specialties has improved, or that the follow-up of patients is more thorough than previously. It is even conceivable that hormone therapy and extirpative procedures, such as adrenalectomy and hypophysectomy, have lengthened survival time in some patients, or at least have altered the natural course of the disease in such a way that hitherto unusual metastases have become more commonplace.

Whatever the explanation, there seems little doubt that choroidal metastases do occur more frequently than has been recognized in the literature. That the occurrence of seven cases in a department with a rela-

* From The Johns Hopkins Hospital.
† Radiologist-in-charge of radiation therapy.

tively small patient load is not entirely coincidental is borne out by the finding of Cade[2] that in 135 patients in whom adrenalectomy had been performed for carcinoma of the breast, 11 had choroidal metastases.

A further possible explanation for the comparatively unusual recording of this site of metastases is that there may be a long interval between the treatment of the primary tumor and the occurrence of the visual disturbance and the patient will report to the ophthalmologist rather than to the surgeon. A more accurate approximation of the true incidence of this complication should be obtainable with the conscientious following of all patients with breast cancer for long periods of time. It seems probable that a careful examination of the eyegrounds in patients with malignant disease would confirm Reese's[12] impression that "subclinical metastases of carcinoma to the area are unquestionably common, particularly in the terminal stages of the disease."

Distribution

As far as can be determined, only one choroidal metastasis has been reported from a carcinoma of the male breast, this by Pollack.[11] The posterior half of the choroid is usually affected but extension forward occurs as the tumor enlarges. Reese[12] states that the left eye is more commonly affected than the right, a statement that is borne out by this series in which the left eye alone was involved in four, the right alone in two, and both eyes in one patient. Bilateral growths are not unusual. Thus, Usher[16] states that in one third of cases both eyes are affected, and Cohen[3] reports that in one fourth the lesions are bilateral.

Age

On reviewing the present series, it was striking to note the comparatively early age of many of the patients at the time when the ocular metastasis was first diagnosed. The only Negro patient was also the youngest, aged 36 years, and was, incidentally, the only patient with bilateral lesions. Two patients were 40 years of age, three were 49, and the oldest was only 54 years of age. Cordes,[4] in his review of the literature, noted that the age group most commonly affected was that between the ages of 40 and 49 years and he could find only isolated cases which had been reported in patients younger than 30 years or older than 70 years.

More remarkable, perhaps, is the early age of the patients in this series at the time of identification of the primary carcinoma in the breast. The youngest was only 31 years, four were between 36 and 39 years, one was 43, and one, 48 years.

Histology

Unfortunately, not all the operations on the breast were done in the same hospital and it was not possible to compare all the sections but there did not appear to be a prevalence of any particular histologic type of primary lesion. One was reported as a comedocarcinoma, one as duct cell, two as scirrhous, and the remainder simply as adenocarcinoma.

Clinical history

The seven patients in this series may be considered in two distinct groups. One of the patients was seen first by an ophthalmologist who discovered the orbital tumor and in the course of physical examination identified the primary lesion in the breast which had hitherto been asymptomatic. In the other six patients, a considerable time interval had elapsed between the mastectomy and the onset of ocular symptoms. In all these cases, the original lesion was reported as Stage I and at least three years elapsed between the primary and secondary manifestations. In one case, the interval was 15 years, and in another 11. This is in accordance with the statements of Cohen,[3] of Reese,[12] and of Willis.[17] The 15-year time interval appears to be the longest duration recorded but, unfortunately, the clinical history on this patient is insufficient to establish definite

proof of the identity of the intraocular lesion.

Tumor cells are presumed to reach the site of metastasis from the primary lesion by way of the blood stream and it would be expected that pulmonary lesions would be found. Lemoine and McLeod[9] confirmed that, in autopsied cases, metastatic deposits were found in the lungs in 83 percent. Willis[17] suggests from his study of the literature that ocular metastatic growths are often associated with an anomalous distribution of metastases in unusual sites. This was not confirmed in the present series but complete autopsies were not performed on any of the patients.

In only two of our patients was there evidence of other metastases at the time of diagnosis of the choroidal deposit but, subsequently, at intervals of from three months to one year, other manifestations of disease occurred in four others, three of whom have since died. Gross metastatic disease became evident in the bones of four, in the lungs in four, liver in one, and in cervical and mediastinal lymph nodes in one patient. One case, to date, has developed no other signs of metastatic deposits after an interval since treatment of six months.

Treatment

A metastasis in the choroid leads to detachment of the retina with resultant loss of vision of that area. As the posterior half of the choroid is usually affected, the macula is frequently involved and vision in the affected eye may be negligible. Because of the detachment of the retina, it seems to be the opinion of some ophthalmologists that vision will be permanently lost in that eye, that the eye is useless, and that it, therefore, should be surgically removed.

In the literature, however, there are several well-authenticated cases of return of some vision to the eye following radiotherapy. With the advent of hormonal treatment and, more recently, of extirpative surgical procedures of the adrenals or pituitary gland, other methods of treatment may also lead to return of vision, as reported by Cade.[2] Furthermore, it would seem unrealistic to assume that the ocular metastasis is the sole manifestation of spread of disease, even though no other spread may be demonstrable at the time, and excision of this metastasis is unlikely to contribute to prolongation of the patient's life. It would, therefore, seem improper to excise the eye in the absence of symptoms such as severe pain from increased intraocular pressure.

Cordes[4] reviewed the literature of patients treated by irradiation and found that X-ray therapy had been employed in three cases, radium in two, and radon in one. By modern standards, the dosage given in any of these cases would be considered quite inadequate, but Lemoine and McLeod[9] reported a case in which vision improved from the ability to see hands at a distance of three feet to 20/50 plus. This patient received 900 r measured in air anteriorly and 600 r laterally to the choroid area. The other eye was also affected and had been removed surgically.

The patients in this hospital were treated with very much higher doses of radiation and some return of vision was obtained in four cases. In two other patients, no further increase in size of the lesions occurred until the time of death. In one other case, not included in the present series, treatment was given to what was thought to be a metastatic carcinoma of the left eye. No improvement in vision occurred and one year later the eye had to be enucleated because of severe swelling and pain. Histologic examination of the eye showed the tumor to be a malignant melanoma. Rosselet and Rosselet[15] have recently reported a further case successfully treated by irradiation.

Technique of treatment

Two different radiotherapeutic techniques were used in the treatment of these seven cases. In the first group, a single portal, 2.5 cm. in diameter, was directed laterally at the

posterior margin of the orbit, attempting to avoid direct irradiation of the lens. A maximum dose of 6,000 r measured on the skin was delivered to one patient and in two others the dosage varied between 3,300 r and 5,200 r. The estimated dose at the tumor varied between 2,500 r and 5,000 r.

In the second technique, adapted from that described by Reese in the treatment of retinoblastoma, an additional portal of entry was used from a medial oblique direction passing through the bridge of the nose from the opposite side. This has the merit of increasing the depth-dose while saving the skin, but the risk of damage to the lens is greater. This objection, however, has little validity in a condition with such poor prognosis, and damage to the conjunctiva and cornea can be prevented by shielding the anterior surface of the eye while the anterior treatment field is being used. In none of the patients was there any noticeable conjunctival reaction and no radiation cataracts have developed to date, although tumor doses of 4,000 r to 5,000 r were delivered to three patients. In Rosselets'[13] case, lens doses of over 9,000 r had been given without cataract formation.

The appropriate hormone therapy was given to those patients who had evidence of other metastases but visual improvement was noted before any hormone therapy in at least two cases. Adrenalectomy and hypophysectomy were not attempted in any patient in this series, but Cade[2] reports favorably on the response of choroidal metastases to adrenalectomy. Dunphy[5] has recently summarized the literature on the effect of these operations and of steroid hormones on metastatic choroidal disease.

Subsequent course

The patient who was found to have advanced carcinoma of the breast at the time she consulted the ophthalmologist, also had bony metastases and, one year following local therapy to the breast and eye, died at her home with widespread bony and pulmonary deposits. She experienced no improvement in her vision but the eye was of no trouble to her.

Six patients presented with metastases to the choroid at intervals varying from three to 15 years after mastectomy for carcinoma. In two, there was evidence of metastases to other areas at the time of referral and these patients died four months and six months, respectively, after their X-ray therapy. Both experienced some subjective improvement in vision and in both instances the metastasis was reduced in extent and in depth.

One patient died one year and two months after her therapy, having had great improvement in her vision until the time of her death. She died in another hospital from extensive metastatic disease of the liver, and the pathologist believed that the sections obtained at laparotomy were probably secondary to a malignant melanoma of the eye. (The original sections from the breast tumor removed 15 years previous were, unfortunately, not available.) This case is, therefore, poorly authenticated and should, perhaps, not be included in this series although the response to X-ray and hormone therapy, the clinical picture, and the course of the disease were totally unlike that of a malignant melanoma.

One other patient has died. She obtained no relief from her X-ray therapy or from subsequent androgen therapy, developed widespread pulmonary and bony lesions, and succumbed one year and three months later. Two patients are still alive for periods of one year and six months, respectively. The first has recently developed hoarseness with vocal cord paralysis, although no definite mediastinal nodes have been demonstrated, but the retina is now completely detached after an initial satisfactory decrease in size of her choroidal metastasis with slight improvement in her vision.

The sixth patient in this group has not shown evidence of any spread of disease to date but has noted slight visual improvement.

In Usher's[16] summary of reported cases, the average survival from the time that the eye was affected to death of the patient was only eight months, and the longest period had been two years. The average survival in the present series is 10 months and two of the patients are still alive, one apparently without evidence of further disease. If these two are excluded, the survival to death still averages 10 months; and no patient has, so far, lived longer than 15 months from the diagnosis of choroidal metastasis. Local radiotherapy to a choroidal metastasis does not apparently reduce the expectation of life of the patient compared with that from surgical excision.

Summary

1. A series of seven cases of choroidal tumors thought to be metastatic from carcinoma of the breast seen in three years in a relatively small Radiotherapy Department would suggest that this site of metastasis is more common than has been previously recognized. The possible reasons for this underestimation are discussed.

2. The treatment of choroidal metastases is discussed and the conclusion drawn that surgical removal of the eye should not be performed in the absence of severe pain until other methods of treatment have been tried, for some useful vision may reappear in the affected eye following local X-ray therapy.

3. The results obtained in this series by using X-ray therapy locally to the metastasis and hormone treatment for widespread disease are presented. Some return of vision occurred in four of the seven cases so treated and resort to removal of the eye was not necessary in any case.

4. Although adrenalectomy and hypophysectomy were not used in any of the present series, the improvement noted by others following these operations makes another argument against excision of the eye except as a palliative measure for severe pain from increased intraocular pressure.

The Johns Hopkins Hospital (5).

Acknowledgments

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ADULT TYPE OF MEDULLO-EPITHELIOMA OF THE CILIARY BODY*

J. Reimer Wolter, M.D., and Burton R. James, M.D.
Ann Arbor, Michigan

Three different types of tumors are known to develop from the pars ciliaris retinae: the benign Fuchs epithelioma, the malignant medullo-epithelioma of the embryonic type, and the malignant medullo-epithelioma of the adult type. Chart 1 indicates the relationship of these tumors to the primitive retinal elements and to the tumors of other parts of the retina.

The Fuchs epithelioma simply represents an epithelial hyperplasia which often occurs in senile eyes or in cases of chronic inflammation. It is of some interest for this study since some authors believe that the adult type of medullo-epithelioma of the ciliary body develops after chronic irritation from such hyperplastic epithelium. The medullo-epitheliomas of the embryonic type (diktyoma) originate in the internal, nonpigmented epithelium of the ciliary body; they usually occur in young children, are malignant, but are not known to metastasize.

Verhoeff[1] published an outstanding description of a tumor of this type and was first to find with special staining methods that the formations of this tumor represented different stages of the embryonic retina. He found embryonic rods and cones, radial fibers of Müller, astroglia, and parts of a primitive hyaloid membrane in this tumor. Verhoeff suggested calling the embryonic type of medullo-epithelioma (diktyoma) a "terato-neuroma" since it typically exhibits elements which resemble those of the primitive retina and since the tumor is highly differentiated.

The embryonic type of medullo-epithelioma (diktyoma) is considered to be composed of more primitive cells while the adult type (also called malignant epithelioma) exhibits cells of a later stage of development of the ciliary epithelium. The medullo-epitheliomas of the adult type also originate in the nonpigmented ciliary epithelium without, however, being known to imitate the embryonic retina. The adult type of medullo-epithelioma is described as being composed of single layers of cells which closely resemble the adult ciliary epithelium. This type of medullo-epithelioma occurs typically in blind, phthisical eyes of adult persons. It is also malignant and is not known to metastasize.

Fuchs[2] published an extensive discussion of the benign and malignant tumors of the pars ciliaris retinae. He accepted Verhoeff's conception of the embryonic type of medullo-epithelioma but not the name which Verhoeff suggested. Fuchs pointed out that both types of medullo-epitheliomas, the embryonic and the adult type, are closely related. This close relationship was later again emphasized by Anderson[3] and also by Reese.[4]

This paper represents the description of a medullo-epithelioma of the adult type which occurred in a 39-year-old man. Special staining methods revealed in this case new pathologic facts which indicate that there really is a very close relationship between the two types of medullo-epithelioma.

Case history

This is the case of a 39-year-old white man who lost vision in his left eye at the age of nine months following an alkali (lye) burn. The eye became phthisical. At the age of 14 years the left conjunctival sac was revised and a shell prosthesis was fitted to cover the shrunken eye.

The patient was first seen in the eye clinic of the University of Michigan in April, 1956, with the complaint of epiphora, O.S. The symptom improved

* From the Laboratory of Neuropathology and Neuro-ophthalmology and from the Department of Ophthalmology of the University of Michigan Hospital, Ann Arbor. This study was supported by Grant No. B-475-C4 of the United States Department of Health, Education, and Welfare.

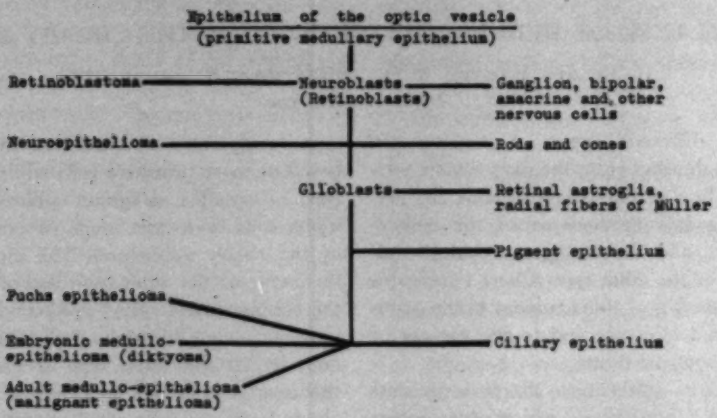

Chart 1 (Wolter and James). Relationship of medullo-epitheliomas to the primitive retinal elements and to tumors of other parts of the retina.

after a new prosthesis was fitted. In May, 1957, the patient returned with the history of left frontotemporal headache and swelling of the lids which had caused him to discontinue the use of the prosthesis three months earlier.

On examination the left lids showed moderate edema and increased redness. There was slight tenderness to pressure over the left orbit. The conjunctival sacs were clear except for a small symblepharon inferiorly, O.S. The bulbar conjunctiva, O.S., completely covered a hard, round, and smooth structure which could be palpated and had the characteristics of a phthisical eye. There was no apparent proptosis of this structure and it was movable. Orbital X-ray studies, including views of the foramina, revealed a fairly round and irregularly calcified mass in the left orbit (fig. 1-arrow). There was no bone destruction associated with this mass and the left optic foramen was not enlarged.

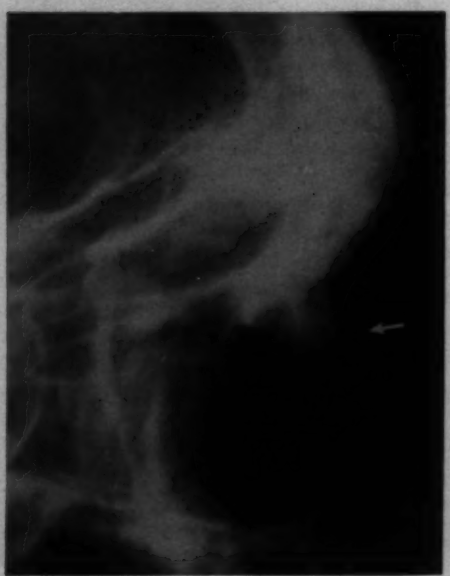

Fig. 1 (Wolter and James). X-ray film of the patient in May, 1957, shows the irregular calcified mass in the left orbit (arrow).

An orbital neoplasm was suspected on the basis of the old injury, the extended history of lid edema and redness, the pain, and the appearance of the opacity in the orbital X-ray films. Enucleation was advised but delayed until July, 1957, because of a family problem. The enucleation was performed by Dr. S. Oleksey of Jackson, Michigan, who reported difficulties identifying the structures of the eye due to marked distortion of muscles and globe, with extensive calcification of the globe itself. After removal of the phthisical globe, two pieces of hard, cartilage-like tissue from the retrobulbar area were also removed.

The globe and the retrobulbar tissue were sent to the Ophthalmic Laboratory of this clinic. Here the histopathologic diagnosis of a medullo-epithelioma of the ciliary epithelium (adult type) was made. The tumor was found in the globe as well as in the retrobulbar tissue. Exenteration of the left orbit was advised.

With this diagnosis and advice the patient was referred back to this clinic. Orbital X-ray studies still showed no abnormality except for a lucite and tantalum mesh implant in the left orbit. The vision in the right eye and the central and peripheral visual fields were normal. Otologic and neurosurgical consultants could find no additional defects. Exenteration of the left orbit was performed in August, 1957.

Histopathologic studies showed that most of the

tumor was rather well circumscribed within the muscle cone. However, there was solid extension of the tumor along the optic nerve and its sheaths to the most proximal parts of its removed portion. Early in September, 1957, a removal of the intracranial and intracanalicular parts of the left optic nerve was attempted without success. The intracranial part of the optic nerve up to the chiasm was found to be very much enlarged. A biopsy of that portion of the optic nerve was taken and was found to be composed of the same tumor as found in the eye and in the orbit.

Histopathologic findings

The globe and two pieces of retrobulbar tissue were sent to us by Dr. S. Oleksey in July, 1957. The globe was phthisical and measured about 15 mm. in diameter. It showed such extensive calcifications that a decalcification had to be done before the eye could be cut on the microtome. Sections of the cartilagelike retrobulbar tissue, however, could be cut, stained, and examined immediately.

This retrobulbar tissue was found to be composed of dense, irregular scar tissue which contained extensive islands of an epithelial tumor. This tumor was made up of rather well-differentiated epithelial cells most of which were arranged in single layers and formed tube- and cylinderlike structures. The tumor cells contained no pigment; many mitoses were seen.

The eyeball was completely degenerated and phthisical. The corneal stroma was thickened, scarified, and vascularized. The corneal epithelium was replaced by a dense layer of vascular and chronically infiltrated scar tissue. Bowman's membrane, Descemet's membrane, and the corneal endothelium were destroyed. The anterior chamber was obliterated and the completely atrophic iris was attached to the posterior surface of the cornea.

The space behind the iris was filled by nonpigmented, densely arranged layers of the same epithelial tumor as the one found in the retrobulbar tissue. This tumor seemed to have originated in the area of the ciliary body which could be recognized because of some surviving parts of the pigmented cell layer and remnants of the distorted and atrophic ciliary body. The shrunken and partly calcified lens could be seen and was surrounded by tumor.

The posterior chamber of the eye was filled by old scar tissue which contained many blood vessels and large areas of calcification and bone formation. The tumor had everywhere extended into the spaces of these organized inflammatory membranes. But the tumor was not very densely arranged in the posterior chamber and seemed here to represent merely extensions of the dense tumor mass in the anterior eye. The posterior part of the sclera was destroyed and virtually replaced by tumor and scarlike connective tissue.

After having examined this eye it was realized that the tumor represented the advanced stage of an adult type of medulloepithelioma of the ciliary epithelium, which had developed in the phthisical eye and perforated the sclera posteriorly.

The examination of the orbital contents after the exenteration of the orbit showed that the tumor formed a well-circumscribed but not encapsulated mass in the muscle cone. The character of the tumor cells in this area was about the same as of the tumor cells in the globe and in the retrobulbar tissue. The cells represented columnar epithelium without pigmentation, were arranged in single layers, and often formed tubelike and cylinderlike formations. There were also many mitoses. The tumor mass in the muscle cone did not involve the eye muscles. However, it had invaded the optic nerve and its sheaths up to the most proximal part removed at the exenteration. The later biopsy showed that the tumor had already extended up into the intracranial part of the optic nerve.

Special staining by the silver carbonate methods of del Rio Hortega[5] revealed some interesting findings which help us to understand this peculiar and rare tumor. The formations of single layers of columnar epithelium which composed the tumor were found

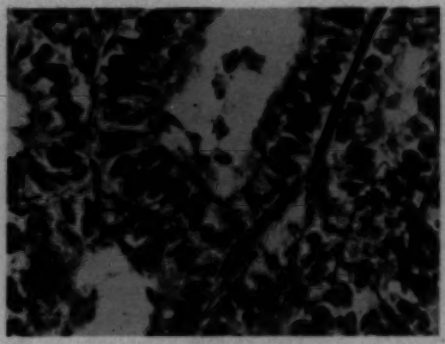

Fig. 2 (Wolter and James). Tubelike or rosettelike formations of the tumor cells in this case of adult medullo-epithelioma. The single layers of cells exhibit a basal membrane of connective tissue fibers. (Frozen section, Hortega method, photomicrograph.)

everywhere to have a distinct basal membrane of connective tissue fibers. These basal membranes were rather delicate in the intraocular parts of the tumor, in the optic nerve, and in the central areas of the tumor in the muscle cone (figs. 1, 6, and 7).

At the marginal areas of the retrobulbar tumor, however, the structures of the tumor cells were surrounded by thick layers of dense connective tissue (figs. 4 and 5). The

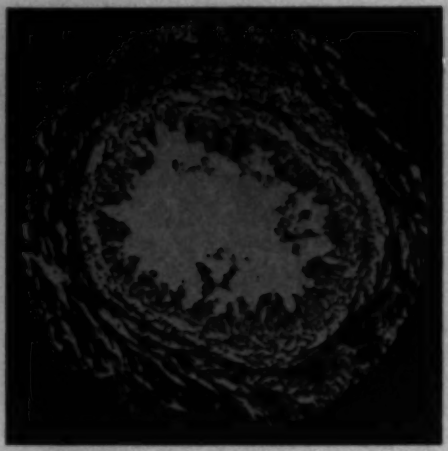

Fig. 4 (Wolter and James). Formation of the marginal area of the tumor in the muscle cone which resembles a primitive optic vesicle. (Frozen section, Hortega method, photomicrograph.)

tumor exhibited many mitoses, all stages of which could be beautifully observed with the silver stain (fig. 3). In its central area the retrobulbar tumor was composed of single layers of cells (fig. 2).

In the marginal areas of this tumor, however, there often were rosettelike formations

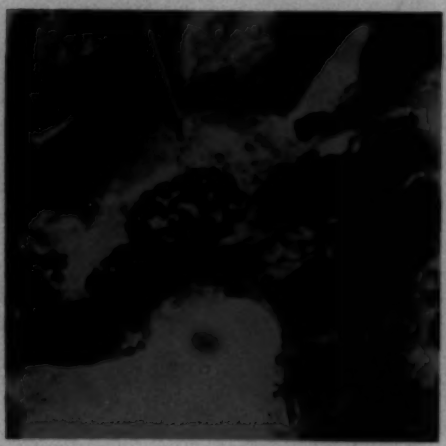

Fig. 3 (Wolter and James). High-power view of a mitosis in this case of adult medullo-epithelioma. The chromosomes of this human cell are clearly visible. (Frozen section, Hortega method, photomicrograph.)

Fig. 5 (Wolter and James). A formation composed of many rosettes which resemble primitive optic vesicles in the marginal part of the tumor in the muscle cone. (Frozen section, Hortega method, photomicrograph.)

in which more layers of epithelial cells occurred (fig. 4). These latter formations were often surrounded by one layer of loose connective tissue and by other layers of dense connective tissue. The whole structure of epithelium and connective tissue often looked like a primitive optic vesicle with a central space, the primitive retina, choroid, and sclera (fig. 4). Structures of this kind were not always single but were also found to be composed of more rosettes with surrounding connective tissue (fig. 5).

In the optic nerve the tumor had replaced virtually all the structures of the normal nerve except for the pial septae (figs. 6 and 7). Remnants of astroglia were found as compressed and degenerated structures surrounded by tumor cells (fig. 8).

The nerve-fiber stain of del Rio Hortega[8] revealed the existence of an abundance of primitive nerve fibers in the tumor. These delicate nerve fibers were distinctly different from the connective tissue fibers of the basal

Fig. 7 (Wolter and James). High-power view of the tumor in the optic nerve. The tumor formations in the picture are typical for the adult medullo-epithelioma of the ciliary epithelium. (Frozen section, Hortega method, photomicrograph.)

Fig. 6 (Wolter and James). The tumor has replaced all the structures of the optic nerve except for the pial septae with its pseudo-acinar formations. (Frozen section, Hortega method, photomicrograph.)

Fig. 8 (Wolter and James). Degenerated and compressed astroglia of the optic nerve surrounded by tumor cells. (Frozen section, Hortega method, photomicrograph.)

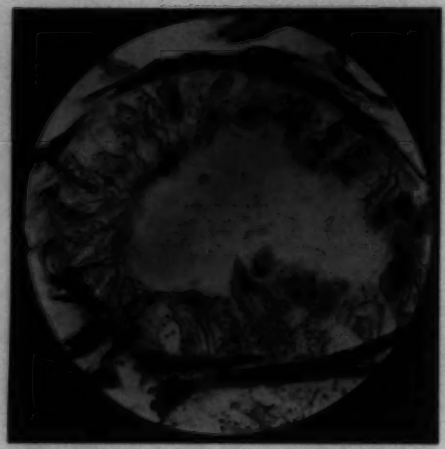

Fig. 9 (Wolter and James). Nerve fiber stain of a rosettelike formation of this adult medullo-epithelioma. Primitive nerve fibers are clearly seen to run radially among the tumor cells. The coarse basal membrane is also stained. (Frozen section, Hortega method, photomicrograph.)

membranes of the tumor cells (fig. 9). They obviously originated within the protoplasm of the tumor cells and were usually seen to run toward the center of the rosettelike formations which were formed by the cells (fig. 9). At the inner surface of these tubelike or rosettelike formations the nerve fibers were seen to form layers most of which were seen to run in one general direction (figs. 10 and 11). The resulting impression was often that of a kind of a primitive nerve-fiber layer.

Discussion

Grinker[6] first classified the malignant tumors of the nonpigmented ciliary epithelium as medullo-epitheliomas. Typical cases of the embryonic type of medullo-epithelioma (diktyoma, terato-neuroma) were described by Badal and Lagrange,[7] Emanuel,[8] Verhoeff,[1] Kuthe and Ginsberg,[9] Fralick and Wilder,[10] Klien,[11] Anderson,[3] Asbury and Vail,[12] and in the late stage by Soudakoff.[13] Cases of the adult type of medullo-epithelioma seem to be rarer. Such cases were published by Collins,[14] Fuchs,[2] Meller,[15] and Reese.[16] Reese[17] recently described a case of embryonic medullo-epithelioma (diktyoma) which originated in the optic papilla. This case shows that such tumors may develop from different parts of the eye.

Collins[14] observed two cases of adult medullo-epithelioma, the first of which occurred in an eye of a 63-year-old woman. This eye had been blind for 25 years following a penetrating ocular injury. The second case of Collins developed in an eye of a 69-year-old man 14 years following an eye injury which had resulted in total blindness. The case of adult medullo-epithelioma of Fuchs[2] oc-

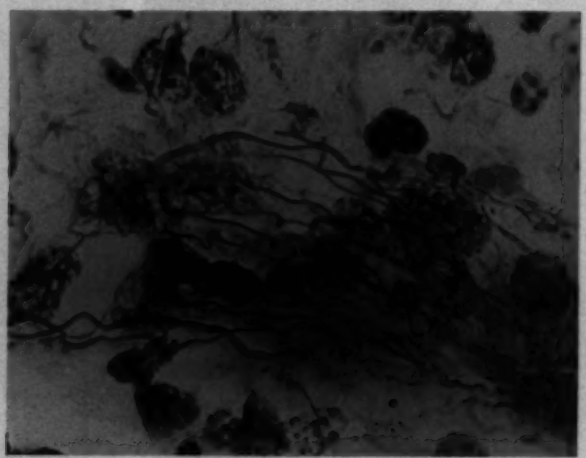

Fig. 10 (Wolter and James). Primitive nerve fibers of the cells of this adult medullo-epithelioma of the ciliary body. (Frozen section, Hortega method, photomicrograph.)

Fig. 11 (Wolter and James). Primitive nerve fibers which form layerlike formations of parallel fibers at the inner surface of the tumor rosettes. These formations resemble the primitive nerve fiber layer of an optic vesicle. (Frozen section, Hortega method, photomicrograph.)

curred in the eye of a 34-year-old man. This eye had been blind and phthisical following a cataract operation at the age of eight months and a later injury. Meller's[15] case was that of a 27-year-old young man, one of whose eyes had become blind and phthisical following several periods of intraocular inflammation when he was a child. The case of Reese[4,16] occurred in a woman, aged 46 years, who suffered a penetrating injury to her right eye at the age of 16 years (30 years earlier). This eye had become blind and showed a typical adult medullo-epithelioma arising from hyperplastic ciliary epithelium.

The present case clinically and histologically represents a typical case of medullo-epithelioma of the ciliary epithelium of the adult type. It occurred in a manner very similar to the cases reported by Collins,[14] Fuchs,[2] Meller,[15] and Reese,[4,16] in a degenerated eye which had become blind following injury or inflammation years ago. This is the most advanced case of adult medullo-epithelioma of the ciliary epithelium reported in the literature. The tumor in this case had filled the eye, perforated the sclera, and extended up into the intracranial part of the optic nerve. The tumor was composed of nonpigmented cells and showed many mitoses. It certainly was malignant. However, there was no sign of metastases.

The silver-carbonate techniques helped to demonstrate in this case some new histologic facts. It was found that the cells of the tumor had a stroma of delicate basal membranes. They also formed numerous primitive nerve fibers. These nerve fibers were seen to form thin layers on the inner surface of the tubelike or rosettelike tumor-cell formations. These layers somewhat resembled primitive nerve-fiber layers. Furthermore, the marginal areas of the retrobulbar tumor exhibited peculiar formations which looked like primitive optic vesicles. These vesicles were surrounded by layers of dense and loose connective tissue structures which suggested primitive structures of the choroid and sclera. These formations were considered primitive attempts of the tumor to form eyes.

Verhoeff[1] was the first to show that formations like those of the primitive retina typically occur in the embryonic type of medullo-epithelioma. The present case of adult medullo-epithelioma, however, shows that the cells of this tumor also exhibit structures which one would expect to occur only in cells of the embryonic retina but not in differentiated cells of the adult ciliary epithelium. This fact reminds us to emphasize the statements of Fuchs, as well as of Anderson and Reese, that the embryonic type and

the adult type of the medullo-epithelioma of the ciliary epithelium are closely related tumors. And we would like to add that the cells of both of these malignant tumors obviously have some of the potentialities of the primitive medullary epithelium and do not simply represent tumors of well-differentiated ciliary epithelium.

One is tempted to think that an ophthalmologist who could have convinced this patient a few years ago to have the blind phthisical eye removed would have saved the patient a lot of trouble—and probably his life.

Summary

An adult medullo-epithelioma of the pars ciliaris retinae occurred in the left phthisical eye of a 39-year-old man. This rare malignant tumor had filled the globe, perforated the sclera, and extended up into the intracranial part of the optic nerve. The tumor was found to contain an abundance of primitive nerve fibers and formed structures which resembled primitive optic vesicles. Its classification and relation to the other tumors of the ciliary epithelium and the retina are discussed.

University Hospital.

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RETROCILIARY CYCLODIATHERMY VERSUS RETROCILIARY CYCLOELECTROLYSIS*

Effects on the normal rabbit eye

L. Benjamin Sheppard, M.D.
Richmond, Virginia

The diagnosis and treatment of glaucoma is a definite challenge to every ophthalmologist. The maintenance of useful vision, normal fields, and normal intraocular pressure becomes his prime objective. The intraocular pressure is determined by mechanisms involved in aqueous production and the ease with which the fluid escapes. More is known of the latter than of the former, as our knowledge of the mechanisms involved in the formation of intraocular fluid is, as yet, incomplete.

If we accept the formation of aqueous humor to be primarily from the ciliary body, ciliary processes, and iris,[1-4] then a controlled destruction of ciliary processes may be expected to reduce the fluid production. The multiple ciliary processes in the rabbit are richly supplied with blood vessels and are covered with abundant epithelium. This may account for the rapidity of aqueous formation in the rabbit[5-8] and the compensation which usually occurs several months after cyclodiathermy or cycloelectrolysis treatments.

Numerous antiglaucomatous procedures have been advocated with varying results. This is particularly true of surgical procedures which are usually employed after medical therapy no longer suffices. No one of these operations has proven entirely satisfactory. Each has its merits but, unfortunately, the complications and incidence of poor results have been relatively high. The surgical aspects have been adequately reviewed by Scheie[9,10] and Berens, et al.[11,12] I shall, therefore, present a controlled study on a series of 53 normal rabbits whose eyes were subjected to retrociliary cyclodiathermy and retrociliary cycloelectrolysis. The work is a comparison with a previous study[13] where similar procedures were performed and treatments were made directly into the ciliary body.

Historical background

In the following section reference is made to a few of the successful antiglaucomatous procedures. Shahan and Post,[14] in 1921, first used thermophore applications to the sclera. Weve,[15] in 1933, pioneered in the use of nonperforating cyclodiathermy over the ciliary region. In 1940 Vogt,[16] reported on the use of perforating cyclodiathermy. Recent studies by Rubin, Romig, and Molloy[17] and Lachman and Rockwell[18] have been published on two series of glaucoma patients treated with perforating cyclodiathermy. They showed encouraging results, although the latter authors conclude that the results were somewhat unpredictable in that loss of visual acuity or phthisis bulbi sometimes occurred. However, it should be pointed out that cyclodiathermy was usually resorted to only after medical and antiglaucomatous surgical procedures were no longer controlling the disease process. Lutman[19] has reviewed the use of nonperforating cyclodiathermy for glaucoma.

Weekers and Weekers[20] and Weekers and Prijot[21] have published work on the retrociliary application of nonperforating cyclodiathermy. Their findings were encouraging and will be commented on later.

Cycloelectrolysis was used by Berens in 1945 as an antiglaucomatous procedure.[11,22]

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Since then, cycloelectrolysis has been used on selected glaucoma patients with encouraging results.[22]

Dynamics of cyclodiathermy and cycloelectrolysis

Cyclodiathermy employs a high frequency current which passes through tissue causing an instantaneous coagulation of the proteins. This is accomplished by the heat generated by tissue resistance to the passage of current. Thus an attempt is made to destroy partially the ciliary body and ciliary processes by placing the diathermy needle in the tissue of that structure. Associated with the destruction in the ciliary region is a decrease in aqueous production and a resulting decrease in the intraocular pressure. The development and use of cyclodiathermy has been reviewed by de Roetth,[23] Albaugh and Dunphy,[24] and by Stocker.[25]

Cycloelectrolysis is the use of a low frequency galvanic current. The destruction of the tissue depends upon the chemical reaction caused by the passage of the galvanic current. Sodium chloride is ionized, resulting in the migration of the sodium ion to the negative pole (that is, the active electrode). It is neutralized and reacts with the hydroxyl ion from the ionization of water to form sodium hydroxide. Sodium hydroxide is caustic to the tissue of the ciliary body.

The advantage of cycloelectrolysis is primarily in the ease with which it may be controlled. The amount of tissue destruction is regulated by varying the duration of treatment and the amperage. Although the amperage may be regulated in cyclodiathermy, the tissue resistance is variable. Thus in cyclodiathermy, the amount of tissue destruction may vary because of the variation of the tissue resistance encountered by the current. In addition, the carbonization caused by "sparking" is avoided by using cycloelectrolysis. Hence, such undesirable effects as shrinkage of the globe, focal scleral necrosis, and ruptured globes are largely eliminated.

The decision to use the retrociliary area as a treatment site was a result of the work of others[20,21] and of an earlier experiment comparing the effects of cycloelectrolysis and cyclodiathermy.[13] Having previously run experiments on a series of animals in which the treatment was directly into the ciliary body[13] it was deemed advisable to compare and evaluate variations of that technique. Following this line of thought and encouraged by the results when several animals were treated by the retrociliary method, it was decided to run experiments on a series of animals.

Technique

Animals

The animals used were young adult albino rabbits, both male and female, which were supplied by one breeder. All animals were run concurrently to avoid any possible seasonal variations. They were housed separately and given a standard diet of pellets.

Anesthesia

From previous work it was found that rabbits withstood eye procedures very well under topical anesthesia if properly handled. The animal was controlled by wrapping it in a large bath towel so as to restrain its legs. It was then placed in a standard rabbit box and held firmly by an assistant (fig. 1). Topical anesthesia was induced by instilling several drops of three-percent cocaine solution into each eye. Within several minutes the operation proceeded with a minimum of trauma.

Intraocular pressure determinations

The intraocular pressure was taken prior to the surgical procedure to obtain an adequate base line for subsequent comparison. For a period of two months, pressure determinations were taken every two weeks after retrociliary cyclodiathermy and retrociliary cycloelectrolysis treatments.

An open system mercury manometer (fig. 1) was used for these determinations. A 25-

gauge hypodermic needle was inserted into the anterior chamber near the limbus and angled parallel to the iris. The needle was connected to the manometer by a small plastic tubing with the whole system filled with mamallian Ringer's solution.

Prior to insertion of the needle into the anterior chamber, the pressure of the system was elevated to the anticipated intraocular pressure to avoid loss of aqueous. The needle was left in the eye until a constant reading was obtained for a five-minute period.

Retrociliary cyclodiathermy

A Walker type diathermy unit was used to provide a uniform current of 40 ma. for a period of five seconds. The eye was rotated downward by grasping the tendon of the superior rectus muscle with forceps. A total of 30 punctures was placed in the superior half of the right globe in two rows approximately five and seven mm. posterior to the limbus. It is important that the right-angled platinum needle (1.0-mm. long by 0.18 mm. in diameter) be inserted through the conjunctiva and sclera before the current is turned on. By this manner, "sparking" of the surrounding tissues is avoided. The right eye was always used for retrociliary cyclodiathermy.

Fig. 1 (Sheppard). *Apparatus.* Apparatus needed for the retrociliary application of cyclodiathermy and cycloelectrolysis and for taking intraocular pressure. Notice the open system mercury manometer with attached tubing and needle inserted into the anterior chamber. The rabbit is held firmly in a standard rabbit box. The apparatus in the background is a specially built cycloelectrolysis machine which employs alternating current, built by Cosby Electric Co., Richmond, Virginia, with variations in amperage from 0 to 10 ma. An application is being made with a right-angled platinum needle, one-mm. long. A Walker type diathermy unit (not shown in photograph) was used for cyclodiathermy.

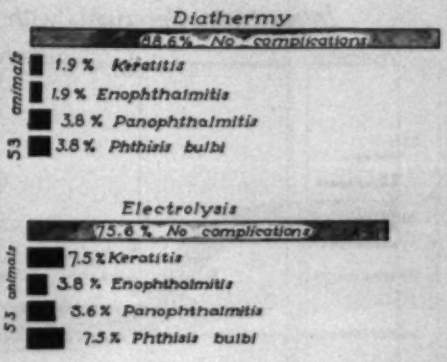

Chart 1 (Sheppard). Comparison of complications following retrociliary cyclodiathermy and retrociliary cycloelectrolysis in the rabbit (53 animals). Right eye treated with retrociliary cyclodiathermy, left eye treated with retrociliary cycloelectrolysis. Complications denote changes that persisted over two weeks.

Retrociliary cycloelectrolysis

An electrolysis machine of special design was constructed to employ a standard 110-120 volt outlet as its source of current. A full-wave selenium rectifier converted the alternating current to direct current and the voltage was stepped down to 22.5 volts by means of a transformer. The amperage was controlled by a rheostat to deliver 0 to 10 ma. The positive pole (inactive electrode) was connected to the rabbit's ear by means of a small metal clip, while the negative pole was attached to the right-angled platinum needle used for perforating the conjunctiva and sclera of the left globe. The number and distribution of punctures was identical to that employed in retrociliary cyclodiathermy. Five ma. of current for five seconds was used because it had been determined to be optimum in previous experiments.[13] The left eye was always treated with retrociliary cycloelectrolysis.

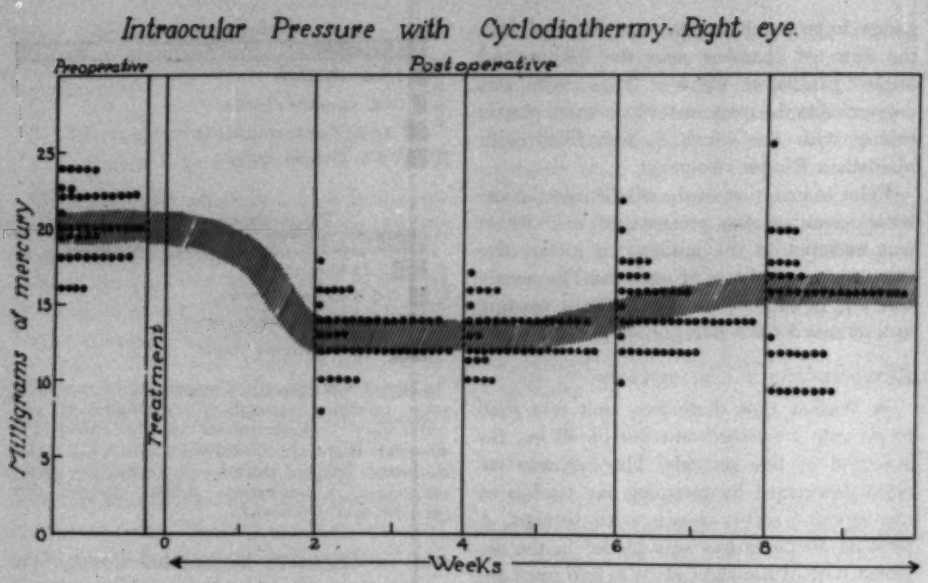

Chart 2 (Sheppard). Intraocular pressures of right eyes treated with retrociliary cyclodiathermy (mercury manometer). Shaded areas denote mean pressures.

Postoperative course

Postoperatively the eyes were treated each day with applications of bichloride of mercury ointment (1:3,000) and atropine ophthalmic ointment (one percent) until all reaction had subsided. Daily observations were recorded and at two-week intervals the intraocular pressure of each eye was taken. At the end of two months the animals were killed and the eyes removed and placed in 10-percent formalin for microscopic studies.

Gross reactions

A total of 53 animals was treated as previously indicated. Chart 1 shows a comparison of the complications encountered.

The usual postoperative course in each procedure was a mild inflammatory reaction of the conjunctiva. This hyperemia and edema cleared in three to four days. This reaction was considered by us to be within the normal range of tissue response to such treatment and therefore these findings were excluded from the complications chart. In those animals which were uncomplicated no gross changes were noted in the iris or lens. Clinical signs of ocular inflammation occurred on the second or third postoperative day in the group of eyes with complications. Thinning of the sclera at the treatment site occurred quite frequently, especially in those eyes treated with cyclodiathermy.

Intraocular pressure changes

The average normal intraocular pressure of the rabbit eye has been found to be 20 mm Hg.[13] In Charts 2 and 3 the effects of retrociliary cyclodiathermy and retrociliary cycloelectrolysis on the intraocular pressure are compared. As will be noted, the results are almost identical.

Due to the position of the eye during the retrociliary treatments it was not possible consistently to retain the hypodermic needle in the anterior chamber in order to take immediate postoperative intraocular pressure readings. In the few cases where it could be retained there was a marked elevation of in-

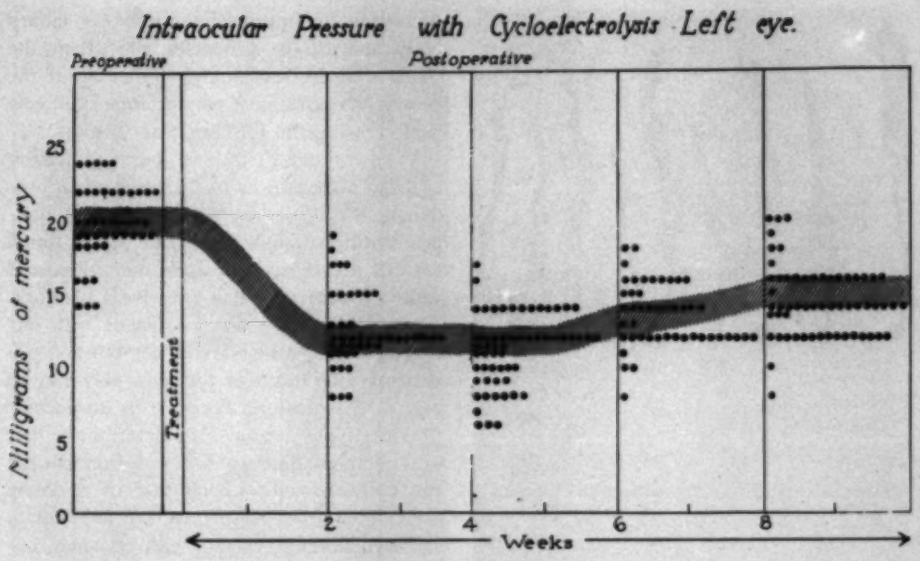

Chart 3 (Sheppard). Intraocular pressures of left eyes treated with retrociliary cycloelectrolysis (mercury manometer). Shaded areas denote mean pressures.

traocular pressure immediately following the surgery, as found in eyes where treatments were made directly into the ciliary body.[13]

As has been demonstrated and correlated with histologic studies the rise in pressure was associated with edema, engorgement, and hemorrhages in the ciliary processes and ciliary body. The subsequent lower pressure was accompanied by atrophic changes in the ciliary processes and associated with decrease in aqueous formation.[13] The drop in intraocular pressure of eight mm. Hg was sustained for six weeks. The pressure showed a gradual ascending curve by the end of eight weeks—the average pressure for eyes treated by both retrociliary methods was four to five mm. Hg below the normal.

Histopathologic changes

Each eye was blocked in paraffin, and frontal sections were made beginning at the ora serrata. The subsequent sections were cut anteriorly toward the pupil. Regular hematoxylin-eosin slides were prepared. The usual reaction observed at the end of the eighth postoperative week in both retrociliary cyclodiathermy treated eyes and retrociliary cycloelectrolysis treated eyes was one of hemorrhage, vascular engorgement, new capillary formation, edema, bullae formation, fibrosis, loss of nonpigmented epithelium, and partial disruption of the pigmented epithelium. The appearance of the normal ciliary body and normal ciliary processes are shown in Figure 2.

In Figures 3 and 4, the features of vascular engorgement with hemorrhage and edema of the ciliary processes are apparent in eyes treated by each method. It should be noted that the reaction was confined almost entirely to the tips of the long processes and in those located more anteriorly while the ciliary body itself was rarely involved.

Histologically the long straight ciliary processes are located posteriorly while the anterior processes are more tortuous and tend to branch. The posterior ciliary processes and the pars plana escaped the full reaction as shown in Figures 5 and 6.

The distribution of reaction seemed re-

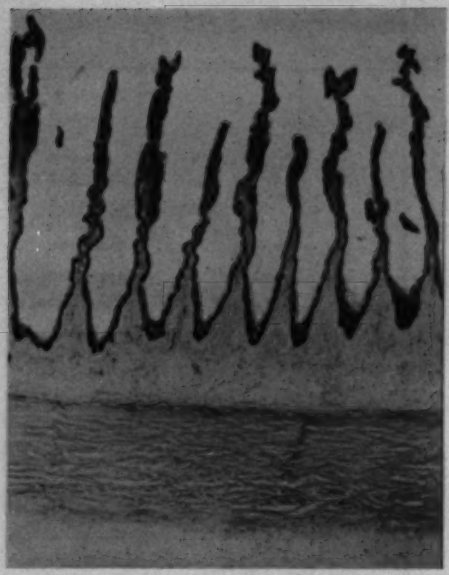

Fig. 2 (Sheppard). *Normal ciliary body and ciliary processes* (×30) NR-68-2. Note the delicate uveal meshwork, the ciliary processes with the intact pigmented and nonpigmented epithelial layers. The normal sclera shows at the lower border of the photograph.

markable in that the site of the main reaction was separated from the area of treatment. Greater reaction would seem more likely in cycloelectrolysis treated eyes, where the chemical change extends into the aqueous which bathes the ciliary processes and iris.

The surface area of the ciliary processes exposed to the aqueous is far greater per unit volume than that of the pars plana. However, the histopathologic changes observed in the cyclodiathermy-treated eyes were almost identical to those treated with cycloelectrolysis.

Lowered intraocular pressure was observed in each eye even though there was a postoperative vascular engorgement of the ciliary processes. This suggests there was some alteration in the formation of intraocular fluids or there was an increased outflow.[2, 26, 27]

If we accept the secretory theory of the formation of aqueous humor by the ciliary body and ciliary processes,[1–3, 5, 8] then the changes in the vessels and epithelium of the ciliary processes must play an important role in decreasing the formation of aqueous.

Weekers and Prijot[21] in their publication are also uncertain as to the mechanism producing the ocular hypotension (after nonperforating cyclodiathermy). They found corneal anesthesia, pupillary dilatation, and vasodilatation of the whole uveal network. The vasodilatation was consistent with our findings. They conclude that nervous and circulatory alterations of the uvea play a large part in the resulting decrease in intraocular pressure. They have also determined that retrociliary diathermy does not diminish the resistance to aqueous outflow or decrease the episcleral venous pressure in the human.

These findings concur with our own observations concerning the changes in the ciliary region. They point to alterations in the ciliary processes as the most likely factor in the resulting ocular hypotension. Apparently several weeks after treatment there occurs a physiologic compensation via some unknown mechanism whereby the output of aqueous is either restored to its preoperative state or the rate of outflow is decreased. This would account for the gradual rise of the intraocular pressure after the fifth postoperative week.

Figures 7 and 8 show a tissue reaction in which the hemorrhage, edema, and vascular engorgement have subsided leaving thin atrophic processes with an eosinophilic protein matrix.

Little or no reaction was found in the adjacent tissues, though the choroid showed engorgement or hemorrhage in several animals.

Comparison of Retrociliary Method with Direct Cyclodiathermy and Cycloelectrolysis

Figures 9 and 10 are representative sections from a series of animals whose eyes were treated directly into the ciliary zone

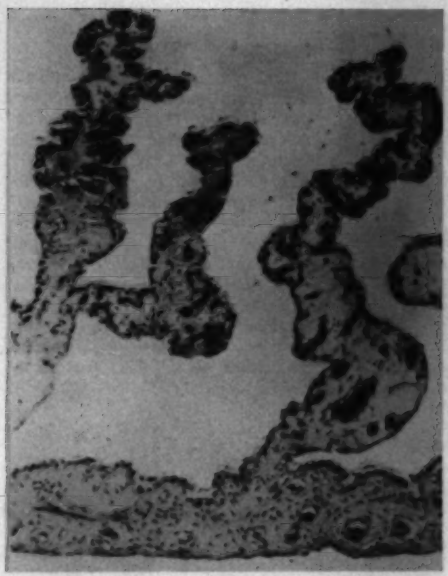

Fig. 3 (Sheppard). *Postoperative reaction following retrociliary cyclodiathermy treatment.* Two months postoperative. Right eye (×70) R-6-OD-5. Note: Increased vascularity with engorgement and hemorrhage of ciliary processes, edema, loss of the nonpigmented epithelium with partial disruption of the pigmented epithelium, minimal reaction in the ciliary body.

Fig. 4 (Sheppard). *Postoperative reaction following retrociliary cycloelectrolysis treatment.* Two months postoperative. Left eye (×70) R-6-OS-5. Note: increased vascularity with engorgement, hemorrhage and bullae of ciliary processes, edema, loss of the nonpigmented epithelium with partial disruption of the pigmented epithelium, minimal reaction in the ciliary body.

Figures 3 and 4 are representative of sections showing more pronounced reactions of the ciliary processes.

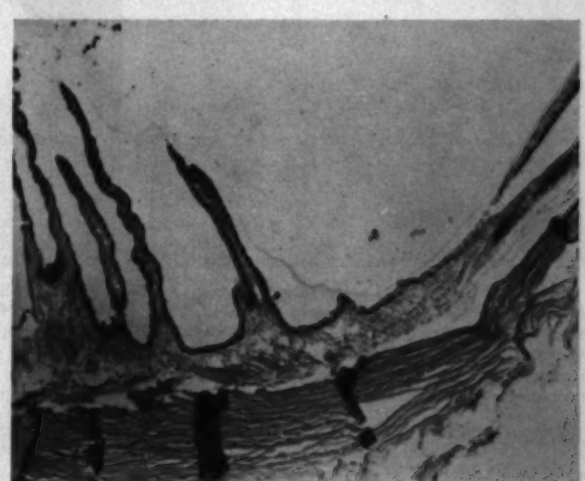

Fig. 5 (Sheppard). *Ora serrata and pars plana. Postoperative reaction following retrociliary cyclodiathermy treatment.* Two months postoperative. Right eye (×30) R-45-OD-4. Note the relative lack of tissue damage except in the tips of the processes although this area lies nearer the treated zone than that shown in Figure 7 which, anatomically, is located more anteriorly in the same eye.

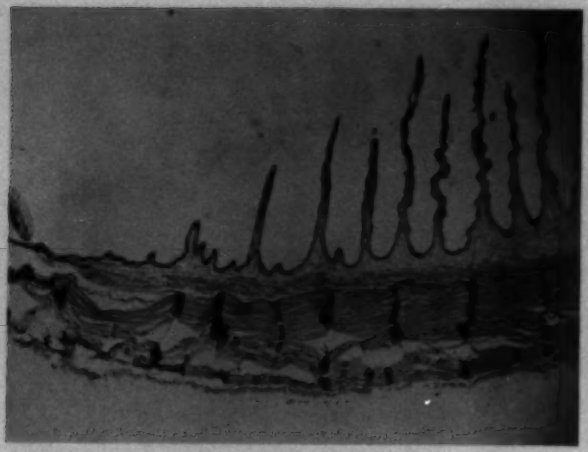

Fig. 6 (Sheppard). *Ora serrata and pars plana. Postoperative reaction following retrociliary cycloelectrolysis treatment.* Two months postoperative. Left eye (×30) R-45-OS-4. As in Figure 5 this area shows a minimal inflammatory reaction in the tips of the straight processes. The area of main reaction, as shown in Figure 8, anatomically, is located more anteriorly in the same eye. The minimal response in the posterior zone was characteristically true in almost all of the eyes treated by either method.

Fig. 7 (Sheppard). *Postoperative reaction following retrociliary cyclodiathermy treatment.* Two months postoperative. Right eye (×70) R-45-OD-4. Note: Thin atrophic ciliary processes, proteinate transudate in the ciliary processes, loss of the nonpigmented epithelium.

Fig. 8 (Sheppard). *Postoperative reaction following retrociliary cycloelectrolysis treatment.* Two months postoperative. Left eye (×70) R-45-OS-4. Note: Thin atrophic ciliary processes, proteinate transudate in the ciliary processes, loss of nonpigmented epithelium.

Figures 7 and 8 are representative of sections showing diminished reactions, the inflammatory phase having subsided and atrophic changes having occurred in the ciliary processes. Minimal reaction noted in ciliary body.

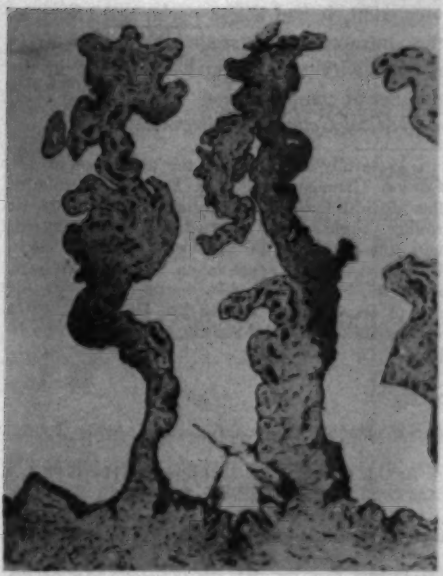

Fig. 9 (Sheppard). *Cyclodiathermy. Direct treatment into the ciliary body.* One month postoperative. Right eye (×80) 45-OD-4. Note: Thickening and fibrosis of the ciliary processes and ciliary body, vascular engorgement, loss of nonpigmented epithelium and occasional loss of pigmented epithelium, edema and proteinate transudate.

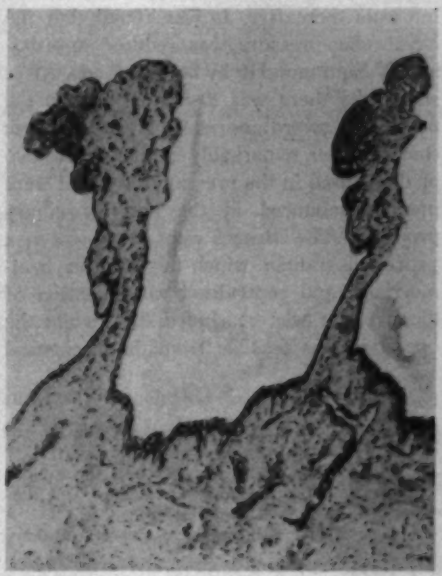

Fig. 10 (Sheppard). *Cycloelectrolysis. Direct treatment into the ciliary body.* One month postoperative. Left eye (×80) 45-OS-7. Note: Edema and proteinate transudate in ciliary processes and ciliary body, fibrosis in ciliary body and ciliary processes, loss of nonpigmented epithelium with occasional loss of pigmented epithelium.

Figures 9 and 10 are representative of sections where treatments were made directly into the ciliary region.

using the same techniques as set forth in this paper. When these figures are compared with the present study (figs. 3, 4, 7, and 8), the involvement of the ciliary body as well as the ciliary processes is apparent. Another finding in the present study was the difference in the intraocular pressure curves. The curves were almost identical in eyes treated with direct cyclodiathermy or cycloelectrolysis, the ocular hypotension being sustained for approximately six months,[13] while in the series presented in this paper (retrociliary method) the hypotension was sustained for about six weeks.

Conclusions

1. Retrociliary cyclodiathermy and retrociliary cycloelectrolysis are mechanically simple procedures.

2. The intraocular pressures of normal adult rabbit eyes are substantially reduced for a relatively short period of time by either procedure.

3. When compared with the direct application of cyclodiathermy and cycloelectrolysis into the ciliary zone, the retrociliary method has a less prolonged effect on the intraocular pressure.

4. The tissue reactions when using the direct method are much more diffuse than when retrociliary applications are employed.

Summary

A series of 53 normal adult rabbits were treated with retrociliary cyclodiathermy in the right eye and retrociliary cycloelectrolysis in the left eye. The intraocular pressures were taken preoperatively and at two-week

intervals thereafter. It was found that the intraocular pressure was reduced approximately eight mm. Hg by both methods. After six weeks there was a gradual rise in the pressure toward normal. Histopathologic changes were remarkably similar in the two methods used in the present study, and were more pronounced in the anterior ciliary processes. The changes were suggestive of a profound trauma which resulted in hemmorrhage and generalized vasodilatation of the uvea. It was concluded that, while the operation was feasible from the mechanical viewpoint, it had a less prolonged effect on the intraocular pressure than the direct method with no appreciable decrease in the number of complications.

Medical College of Virginia.

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AN EXPERIMENTAL INVESTIGATION OF THE BASIC PHENOMENA OF RETINOPEXY*

Part II. Thermal and shrinkage measurements

Henry A. Knoll, Ph.D.
Los Angeles, California

Introduction

When ocular tissues are subjected to treatment with electric currents, as in retinopexy procedures, the electrical energy is converted into heat energy. The thermal insult to the choroid, which is the desired effect in retinopexy operations, may be complicated by thermal effects in the sclera, retina, vitreous, and subretinal fluids. This report deals primarily with the thermal effects produced in the sclera. The results as they relate to the sclera at known distances from the treating electrode lead to considerations of the effects in other tissues at similar distances.

During surface treatment of the sclera certain phenomena may be observed visually. The area surrounding the treating needle changes color. The normally white translucent sclera loses its color and becomes almost transparent. These small "clear" spots are reasonably permanent and will not change appearance even after several months.

The second observation is that the sclera shrinks and puckers. As a result of the shrinking of the sclera the intraocular pressure rises. Scheie and Jerome[1] tonometrically recorded the changes of intraocular pressure in freshly enucleated dog eyes as a function of the number of surface treatments. With 10 treatments the tension rose to 70 mm. Hg (Schiøtz). Further treatments caused the sclera to rupture. Results of a similar experiment in vivo will be reported below. It will also be shown that the tension returns to the original value in about five minutes.

It is very difficult to evaluate the permanent nature of the thermally induced shrinkage. Scheie and Jerome[1] have shown that in dogs the reduction in ocular volume due to scleral shrinkage persists over a period of at least two months. The reduction in volume at the end of two months was approximately 75 percent of the original reduction. These findings are somewhat difficult to correlate with the extensive reports given concerning the nature of thermally shrunken collagens.

Gustavson[2] describes collagenous fibers taken from the hides of cattle and subjected to shrinkage measurements as feeling like glue and demonstrating rubberlike elasticity. It has been further shown that the tensile strength is greatly lowered. If this is what happens to the collagenous fibers in the sclera one would not expect the sclera to remain shrunken as did Scheie and Jerome. However, it must be kept in mind that the conditions of these two reports vary in two respects: (1) the hide measurements are done on dead tissue completely removed from the body, and (2) the entire sample is subjected to the thermal treatment. In the living animal

* From the Department of Biophysics and Department of Surgery, Division of Ophthalmology, University of California. This investigation was supported by Research Grant B-471 from the National Institute of Neurological Diseases and Blindness, United States Public Health Service, Bethesda, Maryland.

repair and replacement may take place. At the active electrode temperatures exceeding the shrinkage temperatures are certainly realized but in the area surrounding the active electrode a steep temperature gradient exists and, perhaps, the sclera subjected to subshrinkage temperatures will not lose its tensile strength.

In order to establish some sort of explanation for the observed facts an attempt was made to map temperature gradients surrounding the active electrode and shrinkage temperature measurements have been made on sclera taken from freshly enucleated eyes.

Temperature measurements

During surface and puncture treatment using a large area ground electrode and a small active electrode the current density is very high in the immediate vicinity of the point of contact of the active electrode and falls off in an inverse square manner. Since the heat dissipated is proportional to the current density the heat gradient will vary as does the current density.

The ocular tissues are not electrically homogeneous and hence such a simple approach may not be completely valid. An attempt was made to map out the heat gradient in the sclera and in the vitreous, but because of numerous difficulties a complete mapping was abandoned. The results for each treatment were found to be very variable depending upon the moisture on the sclera, the relationship of blood vessels to the thermocouple and the treating electrode, and the pressure with which the needle is placed upon the sclera. When the thermocouple was approached within two mm., an electric arc developed between the treating electrode and the thermocouple leads.

In order to reduce the number of animals and trials, it was decided to use a standard distance of three mm. and use the inverse square relationship as a first approximation.

The measurements were carried out using a thermocouple (iron-constantan) and a Brown strip recorder. The thermocouple junction was placed just below the sclera or in the vitreous. A lid speculum placed in the same eye being treated was used as the ground electrode. From the standpoint of minimum interference between the treating current and the electronic circuit in the Brown recorder this placement of the ground was ideal. A pointed, cone-shaped electrode was used to treat the sclera.

Cats were used as the experimental animals. The anesthesia used in all the experiments was nembutal injected intrapleurally. The dosage used was 30 mg./kg. of body weight. The equipment used to treat was a Walker Combination Galvanic and Diathermic Unit. A dial setting of 40 was used throughout. The treating current was kept on for three seconds.

The average temperature rise in the sclera associated with surface treatments at three mm. from the thermocouple was 5.8°C. This value represents the average of 18 treatments done on four animals. The individual values varied between two and 16 degrees. These extreme values indicate the great variability pointed out earlier.

Applying the inverse square law to the average value above this would mean that the sclera would attain a temperature of 62°C. to 65°C. at a distance of one to one and one-half mm. from the treating needle. This temperature, as will be seen below, represents the shrinkage temperature and results in the color change of the sclera. These figures are in agreement with the size of the "clear" spots observed visually.

There is no lag between the onset of the treatment and the very abrupt rise in temperature. This was observed at distances as great as seven mm. away from the treating needle. This would indicate that the heat measured at this distance is the direct result of the transmission of the electrical energy rather than a spread of heat developed closer to the needle.

The drop in temperature once the treating current is turned off is rapid at first, but

drops more gradually after about five seconds. A total of about 30 to 40 seconds is required before the temperature of the treated area returns to the animal's normal body temperature.

With the thermocouple placed in the vitreous, temperature rises associated with surface treatments of more than 5°C. were never detected even though the thermocouple junction was brought to within one mm. of the retina and the sclera treated directly above the thermocouple, giving a total thermocouple to electrode distance of approximately three mm. This lower value would be explained by the fact that the choroid acts as an excellent heat insulating layer by virtue of the fact that the blood will carry off the heat.

When the treating electrode penetrates the sclera and choroid, temperatures in the sclera and the vitreous at three mm. from the treating electrode exceed the boiling point for a brief fraction of a second. These temperatures are possible since the pressure of the globe rises very abruptly as a result of the shrinking of the sclera and the formation of steam in the vitreous. These temperatures will result in the shrinkage of collagenous fibers in the vitreous as well as in the sclera.

Shrinkage measurements

If collagen fibers are placed in a saline bath and the temperature of the bath is slowly raised the fibers will be observed to shrink to about one third or one half of their initial length at a very characteristic temperature. This has been called the shrinkage temperature. Gustavson[2] gives values for collagen fibers from various animals and Brunish[3] has published values for the vitreous body. The shrinkage temperature is somewhere in the range 60°C. to 65°C. The fibers will shrink at temperatures below this value, but at a much slower rate. Over a limited range a two-degree rise in temperature reduces the time required for shrinkage by half.[2]

Shrinkage temperature determinations were carried out using strips of pig sclera and cornea. A small strip of tissue was cut and suspended in a bath of normal saline. The lower end was rigidly fastened and a silk suture was passed through the upper end. The suture was attached to a muscle lever which was used to record the change in length as the bath was heated.

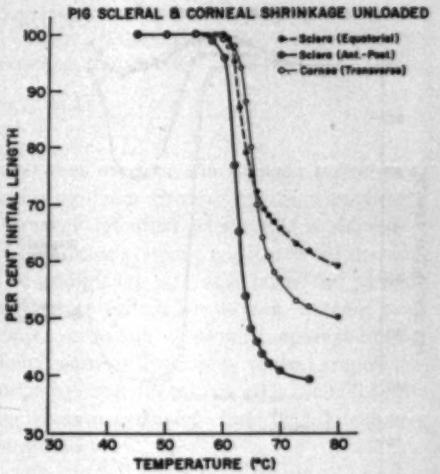

Fig. 1 (Knoll). Shrinkage temperature measurements for pig sclera and cornea. Strips three-mm. wide and 10-mm. long were used.

Figure 1 shows the plotted data. It will be noted that an anterior-posterior strip of sclera shrank more than a transverse strip. This is in accordance with the histologic knowledge of the orientation of the fibers in the sclera. It will be further noted that the shrinkage temperatures fall within the range given for collagen fibers from other sources.

Gustavson states that loading the strip raises the shrinkage temperature one to two degrees for a "light weight." The above experiment was carried out using rabbit sclera strips three-mm. wide unloaded (that is, only the weight of the muscle lever), and weighted with 10 and 20-gm. loads. The data are plotted in Figure 2. A clear-cut rise in shrinkage temperature is evident for the 10-gm. load, but the 20-gm. load stretched the strip so much that an accurate determination

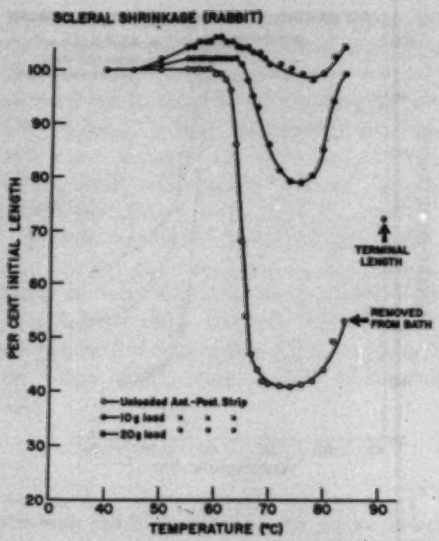

Fig. 2 (Knoll). Shrinkage temperature measurements for rabbit sclera. Strips three-mm. wide and 10-mm. long were used.

of shrinkage temperature was not possible.

Some of the energy delivered to the tissues by the passage of the electric current appears indirectly as a rise in intraocular pressure. How much does the pressure rise and how rapidly does the pressure return to normal? In order to find the answers to these questions a pressure strain gauge was connected to the anterior chamber of a cat's eye through a 24-gauge hypodermic needle and the pressure changes recorded on the Brown strip recorder. Single surface treatments raised the intraocular pressure 10 mm. Hg and the return to normal pressure occurred in about 60 seconds. Six consecutive treatments raised the pressure from 20 to 30 mm. Hg, with a return to normal in about three to five minutes. Much larger (30 to 50 mm. Hg) pressure changes can be brought about by simply pressing on the globe with a muscle hook or by pulling on a fixation suture. In these cases the pressure changes are very rapid, taking place in a matter of seconds.

Summary and Conclusions

Temperature measurements and pressure measurements have been made in cats' eyes during surface treatment of the sclera with a Walker Unit. The setting used was 40 and the duration of the treatment was three seconds. The following results were established:

1. The average temperature rise in the sclera, three mm. from the treating electrode, was 5.8°C.

2. Temperature increases in the vitreous at comparable distances were much smaller. This is probably explained by the fact that the choroid acts as an insulating layer by virtue of the fact that the blood will carry off the heat.

3. The shrinkage temperature of pig sclera and cornea and rabbit sclera fell within the range established by others for skin collagens and vitreous (60°C. to 65°C.).

4. Scleral temperatures will exceed this shrinkage temperature during surface treatment close to the active electrode.

5. Pressure increases of 10 mm. Hg per treatment were measured. The time required to return pressure to normal was about 60 seconds.

6. Additional treatments will elevate the pressure still further, with longer recovery time needed to restore normal intraocular pressure.

7. Temperatures of 100°C. and above were recorded in the vitreous when the active electrode punctured the sclera and choroid. This type of treatment could lead to vitreous shrinkage.

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ETHOXZOLAMIDE*

A NEW CARBONIC ANHYDRASE INHIBITOR

DAN M. GORDON, M.D.
New York

During the past two years 6-ethoxybenzothybenzothiazole - 2 - sulfonamide (ethoxzolamide†), a new potent carbonic anhydrase inhibitor, has been tested clinically to determine its sphere of usefulness in ophthalmology. It is a pure white, crystalline, solid, both odorless and tasteless, and is employed orally in 125 mg. tablets. Practically insoluble in water, it forms soluble salts with alkali. It is stable in the solid form and is nonhygroscopic.

In vitro,[1] 50 percent inhibition of carbonic anhydrase activity was achieved with a concentration of ethoxzolamide of 2.7×10^{-8} moles. In vivo studies in rats, dogs, and monkeys showed excellent diuretic responses at doses of 2.5, 5.0, 10. and 20 mg./kg. Increases in urinary volume and sodium and potassium were marked and were highest in the first six hours after administration.

Toxicity studies yielded an acute LD_{50} of greater than 1,000 mg./kg. Subacute and chronic feeding experiments failed to reveal any drug-related organ lesion at dose levels of 10, 30, and 100 mg./kg.[1]

Administration to human subjects with congestive heart failure has failed to show any organ sensitivity or lesion. Occasional nausea, dizziness, or numbness and tingling of fingers or toes or at the mucocutaneous juncture of the mouth or anus have been experienced. However, all side-effects subside when the dose is reduced or discontinued and, if they are mild, they may subside without change in dose.[2,3]

Because my primary interest is the therapy of intraocular inflammations, it was only natural that most of the patients tested were suffering from chronic uveitis, complicated by water retention which was a side-effect of long-term systemic corticosteroid therapy. The compound was also tested in patients with acute primary glaucoma, chronic glaucoma, secondary glaucoma, epithelial-endothelial corneal dystrophy, central serous retinopathy, and, almost routinely, on 600 adults on whom a cycloplegic had been previously employed.

WATER RETENTION

Early in the history of corticosteroid therapy the impression became prevalent that systemic potassium chloride administered in varying doses, together with concomitant salt and water restrictions, would prevent undue water retention. As experiences multiplied, it became apparent that most patients do not co-operate in any policy of restriction, and that potassium chloride alone did not adequately prevent water retention. At that point I began to experiment with diuretics, including carbonic anhydrase inhibitors. At first I used acetazolamide and, during the past two years, ethoxzolamide.

To control their water retention problems, 32 patients with chronic uveitis have been given ethoxzolamide for from six months to two years. It was necessary to discontinue this regimen in eight others because of paresthesias, gastrointestinal disturbances, and other side-effects brought about by the medication. Of these eight patients, four were able to tolerate acetazolamide and four were not. Four other patients who would not tolerate acetazolamide were able to tolerate ethoxzolamide. Of the group (32 patients who were on the ethoxzolamide regimen), six have secondary glaucoma, so that here the carbonic anhydrase inhibitor performs

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* From the New York Hospital-Cornell Medical Center and The Lillian Margolyes League.

† Supplied as Cardrase through the courtesy of E. Young, M.D., The Upjohn Company, Kalamazoo, Michigan.

a double function, controlling the water imbalance as well as the secondary glaucoma.

The side-effects of ethoxzolamide are similar to those found with acetazolamide and the other carbonic anhydrase inhibitors tested to date; namely, paresthesias of the hands and feet, mild gastrointestinal disturbances, and a sensation of general lack of well-being. In many of the patients, the experiences were similar to those noted previously with acetazolamide; namely, that the side-effects were somewhat dependent on the dosage, and that most patients could tolerate them. As the dosages were decreased, the side-effects usually tended to disappear. Unfortunately this was not always true.

The dose employed is the minimum which will control the water retention as measured by the patient's appearance (moon-face) and weight. As a result of trial and error, a schedule of 125 mg. of ethoxzolamide given once daily, three times a week (Monday, Wednesday, and Friday), has proved adequate in most patients. In those who are not well maintained on this schedule two tablets of 125 mg. each, given four hours apart, are employed three times a week. It has been found that 125 mg. of ethoxzolamide are approximately equivalent in effect to 250 mg. of acetazolamide.

When ethoxzolamide is effective, an average weight loss of two to four pounds is noted each day it is used. One patient lost seven pounds in 24 hours after he had taken a 125 mg. dose. During the earlier months of our work. the higher figure of four pounds was the more customary loss. With some of the patients, the 125 mg. dosage continues to be useful over the many months of use; with others, it will be necessary to employ 125 mg. twice a day, three times a week.

Of the original group, 13 have, during the past several months, required the additional use of two cc. of a mercurial diuretic* once or twice a week in order to produce a satisfactory weight loss. It has been learned that a more satisfactory diuresis is obtained with mercurials when the patient is given ethoxzolamide once on the day preceding the injection of the mercury and once on the day of the injection. Here the ethoxzolamide serves as a primer. In some cases the mercurial alone has caused a weight loss of only one or one and one-half pounds, whereas, when the patient was first primed with ethoxzolamide and the mercurial then employed, the weight loss was approximately three to four pounds. No evidence of abnormal potassium loss has been noted in any of this group over the two years of administration.

*Given as mercuhydrin deep intramuscularly.

Primary glaucoma

Eight patients (10 eyes) with acute angle-closure glaucoma have been treated with ethoxzolamide. Here, an arbitrary initial dosage of 250 mg. (two tablets) has been administered. Each of two of the patients had two attacks, both controlled with this dosage. Two of three others who were not controlled with the oral ethoxzolamide responded rapidly to intravenous acetazolamide. The third failed to be benefitted by either oral or intravenous acetazolamide.

Since I have so frequently found that patients with acute angle-closure glaucoma, who fail to respond to oral carbonic anhydrase inhibitors, show excellent and more rapid results when the drug is administered intravenously, this method has become almost routine in my treatment of acute narrow-angle glaucoma. In those patients who were controlled with the oral ethoxzolamide, the effect was noted in from 40 to 90 minutes, with an average of approximately 75 minutes. Concomitantly, miotics were intensively employed.

Eleven patients with chronic glaucoma have been treated successfully for from six to 24 months with ethoxzolamide. Of the 11, two had had a previous intolerance to acetazolamide but not to ethoxzolamide. Six others were discontinued because of inabil-

ity or unwillingness to tolerate that amount of the medication which was necessary to control their pressure adequately, and three of these exhibited the same intolerance to acetazolamide. The range of pressures were from 30 mm. Hg. (Schiøtz) to 40 mm. Hg. Most of these were in the 30 to 35 mm. Hg. category, after the use of pilocarpine, two-percent, four times daily. Following the administration of ethoxzolamide, the pressure dipped to an average of 15 mm. Hg. to 23 mm. Hg. (Schiøtz); the majority to around 18 to 20 mm. Hg. The tensions in the normal eyes were not significantly affected, dropping from 0 to 2 mm. Hg.

One patient who had been studied tonograhically while on acetazolamide was found to have essentially the same reduction of flow with ethoxzolamide..

The dose of ethoxzolamide would appear to be 125 mg. given every six hours around the clock. However, most of the patients could be controlled on lesser amounts of medication. I attempted to work out the exact dosage for each patient on a trial and error basis, taking into consideration the curves of the intraocular pressure and the degree of tolerance or intolerance to the drug which is, apparently, quantitative. In most patients 125 mg. four times daily was the initial dose, which was then reduced to the minimum requirement for that patient which would maintain the tension within normal limits. This usually meant approximately one-half tablet (62.5 mg.). three to four times daily. Concomitant miotics were employed.

The ideal method of administering any carbonic anhydrase inhibitor would be to plot the individual patient's phase variation (that is, time or times of day when pressure is routinely highest) and then anticipate that with the minimum dose which would prevent that peak rise, when given approximately two hours before.

All but three cases in this group are of the open-angle type of glaucoma. I dislike employing any carbonic anhydrase inhibitor for long periods in narrow-angle glaucoma unless circumstances render such treatment unavoidable. I feel, as does Chandler,[4] that while it may be possible to control the pressure in narow-angle glaucomas, it may not be possible to prevent the formation of additional peripheral anterior synechias which may some day cause the patient to require much more extensive surgery than would have been otherwise necessary.

A patient is never started on ethoxzolamide until it has first been proven that he cannot be maintained adequately upon miotics alone.

Becker[5] and Knighton[6] have each found that ethoxzolamide (Cardrase) functions similarly to acetazolamide. Becker comments on the fact that some patients can tolerate one and not the other and states that, "In such a fashion this new drug appears to have a definite place in the armamentarium of the ophthalmologist."

Three patients with absolute glaucoma have been carried for approximately six to eight months on ethoxzolamide, one-half tablet to one tablet four times daily. In none of these was the drop in pressure very great, approximating 15 mm. Hg. (Schiøtz). However, all three of these patients feel more comfortable with the ethoxzolamide.

Central serous retinopathy

I have been unable to demonstrate any beneficial effect in five patients with macular edema who were given 125 mg. of ethoxzolamide four times daily for one to three weeks. My experience has been similar with four other patients in whom 250 mg. of acetazolamide were employed for one to three weeks.

Epithelial corneal dystrophy

Five patients with combined endothelial-epithelial corneal dystrophy of the Fuchs' type were treated with ethoxzolamide, 125 mg., four times daily, for three to six weeks. A sixth patient was unable to tolerate the medication and had to discontinue it after approximately a week. Two of the five patients exhibited reduction in edema when

viewed under the slitlamp. This "improvement" was not apparent to the patient nor was it apparent to the examiner on testing the patients' vision. Therefore, the medication was not considered beneficial and was discontinued.

Routine use after cycloplegia

During the past two years in office practice I have employed ethoxzolamide in single 125-mg. doses in approximately 600 patients over 40 years of age, in whom cycloplegia has been employed, and in some of whom there was a fear of rise in intraocular pressure. In the group of patients so managed not one single case of acute narrow-angle glaucoma has been precipated. On the other hand, I must point out that only two such cases have ever been noted in my office without the use of a carbonic anhydrase inhibitor. However, when the examiner fears that he may precipitate such an attack, it is wise to employ a carbonic anhydrase inhibitor such as ethoxzolamide at the same time as the cycloplegic. In all of these patients, a miotic is instilled routinely following the examination.

Every ophthalmologist should have some tablets of carbonic anhydrase inhibitor readily available in his office (or bag) at all times.

Summary and Conclusions

A new, potent carbonic anhydrase inhibitor, 6-ethoxzolamide (6-ethoxybenzothybenzothiazole - 2 - sulfonamide), has been tested successfully for two years. It has essentially the same fields of action in ophthalmology as other previously reported carbonic anhydrase inhibitors; namely, the production of diuresis and the reduction of intraocular pressure. It has the same side-effects as other carbonic anhydrase inhibitors, especially the paresthesias of the hands and feet, which are dependent upon the dose of drug employed.

Ethoxzolamide was not found to be of any practical value in removing edema from the cornea or retina in corneal dystrophies or central serous retinopathy. It was excellent in reducing water retention in patients on long-term steroid therapy. When the patient also had a secondary glaucoma, the ethoxzolamide played a double role: reducing water retention and controlling the intraocular pressure.

It must be remembered that a specific carbonic anhydrase inhibitor may function in a patient who finds another form of carbonic anhydrase inhibitor intolerable. For this reason, the introduction of another potent tension-lowering agent is welcome.

441 East 68th Street (21).

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MYOPIA OF PREMATURITY*

JOSEPH E. ALFANO, M.D.
Chicago, Illinois

Milder, self-limiting, or abortive forms of retrolental fibroplasia are now being recognized. Because the milder forms of this disorder may present rather nonuniform pictures there may be difficulties in diagnosis. Anomalous retinal vascularization, peripheral retinopathy or degeneration, optic atrophy, derangement of the vessels at the optic nervehead, vitreous haze, strabismus, nystagmus, or myopia may be among the findings. This report pertains to the myopia which has been reported as occurring in this disorder and has been referred to as the myopia of prematurity.

Krause,[1] in speaking of the final visual result which occurs in retrolental fibroplasia, states, "not all children were myopic, for some had a high hyperopia." Of 41 eyes in which Krause reported the cycloplegic refraction findings, 35 showed a myopic refractive error ranging to as high as 30 diopters. The range of the visual acuity in these eyes was from light perception to 20/30.

Reese[2] in his discussion of retrolental fibroplasia states that, "the corrected vision of a number of patients who have had a cycloplegic refraction shows a refractive error of between four and eight diopters of myopia." His series included 18 eyes in 13 patients. The final vision in these eyes fell as low as 3/200. The age of these patients ranged from four to 11 years. Three of them showed Grade 1; three, Grade 2; and seven, Grade 3 retrolental fibroplasia; all in the cicatricial stages of this disease.

According to Birge,[3] in the myopia which occurs after retrolental fibroplasia certain factors occur with regularity:

1. The myopia of prematurity is different from the severe type of progressive, malignant myopia but may be extensive enough to resemble this latter form.

2. The myopia of prematurity usually begins as a severe grade of myopia often times in the range of 10 or 11 diopters.

3. The myopia of prematurity is not rapidly progressive and if discovered at the age of one or two years often does not progress for the next decade.

The myopia of prematurity may be associated with optic atrophy, mental retardation, nystagmus, and strabismus, rather than retinal atrophy and choroidal degeneration.

In the series of seven cases reported by Birge,[3] all of the infants were premature and the birth weight, which was known in five of these seven cases, ranged from four to five lb. All of the infants had received oxygen for variable periods of time. The myopia in his cases was always bilateral, ranging from a —0.5D, sph. to a —16.0D. sph. In five of these seven cases the degree of myopia was almost the same in each eye; in the remaining two cases, the myopia was of different degrees in each eye. In one of these two cases this difference in degree was quite marked. In five of these eyes the final visual result was 20/20, in one eye 20/25, in three eyes 20/30, one eye 20/40, one eye 20/50, one eye 20/60, one eye 20/80, and one eye 20/200. The fundus findings in these cases included tortuous vessels, vitreous opacities, choroid atrophy, choroid retraction, and highly myopic fundus changes.

Fletcher and Brandon,[4] studied the development of the eyes in 462 premature infants, 136 of whom subsequently developed retrolental fibroplasia. These premature infants, during the very early neonatal period, were found to have a high and fluctuating myopia which was of greater degree in the smaller infants with immature eyes and in those prematures who subsequently developed retrolental fibroplasia. Likewise, the greater the severity of the retrolental fibroplasia, the more severe was the preceding and concur-

* From the Department of Ophthalmology, The Chicago Children's Memorial Hospital and the Northwestern University Medical School.

rent myopia. Those premature infants who did not develop retrolental fibroplasia usually lost their myopia by the age of one year, whereas in those who developed retrolental fibroplasia the myopia was retained or intensified.

The disappearance of the myopia in prematures who do not develop retrolental fibroplasia agrees with the findings of Gastren[6] who, in a study of 480 infants born before term and examined at the average age of nine years, found that there was no significant difference in refraction in the premature and the control group, although amblyopia and disturbance in binocular vision were definitely higher in the premature group. It was also found that the incidence of ocular defects increased with the diminution in birth weight.

Regarding etiology, Fletcher and Brandon[4] feel that the myopia in these premature infants appears to be associated with the immaturity of the eyes, perhaps in association with an underlying disturbance in the media which produces changes in the axial length, corneal curvature, and the index of refraction.

Tait,[5] in a discussion of this work by Fletcher and Brandon,[4] stated that he felt that the spherical shape of the lens in the immature eye and the rapid development of the cornea to nearly adult size during the last two fetal months were also factors to be considered.

The significance of the administration of oxygen, temperature changes, and electrolyte imbalances in the production of this myopia of prematurity has not been ascertained up to the present time.

Case reports (table 1)

Case 1

A white male infant, whose birth weight was two lb. two oz., and who received oxygen for two months following delivery, presents a case of particular interest because he showed myopia of prematurity in the right eye with almost no fundus changes and a blind left eye with an opaque retrolental membrane from far advanced retrolental fibroplasia.

The patient was first seen at the age of three and one-half years. He had been admitted to the hospital for possible orthopedic surgery resulting from a left hemiplegia presumed due to right-sided cerebral bleeding at the time of birth. Excepting for the ocular findings and the signs of a left spastic hemiplegia the child was considered to be in good health.

Examination of the right eye revealed that the patient was able to see and follow the light and to recognize small toys and objects on the floor. He took part in the usual children's activities on the ward with no difficulty. The right eye appeared to be of normal size. Pupillary reaction was normal as was ocular motility. The iris appeared normal and the lens was clear.

Examination of the fundus revealed the vitreous to be clear and the disc slightly pale. The vessels were tortuous throughout but no dilatation was seen. The retinal vessels at the surface of the disc showed some degree of nasal retraction. No areas of retinal atrophy or detachment were seen. There was, however, some piling up of the pigment in the inferior half of the fundus.

Examination of the left eye revealed it to be microphthalmic with no light perception. The cornea was slightly hazy, the anterior chamber shallow, and the lens clear. Situated behind the lens was a completely opaque somewhat vascularized retrolental membrane.

X-ray studies of the skull were not remarkable and no intraocular calcifications were seen.

The patient had a refractive error of —7.0D. sph. in the right eye. There was also a left esotropia of approximately 15 degrees which was unimproved with correction.

Case 2

A white female, with a birth weight of three lb. eight oz., received oxygen for three weeks after delivery. She was first seen at the age of six years, with a history that the left eye turned in since birth.

Visual acuity without correction in the right eye was 20/800 and in the left 10/800. External examination revealed an esotropia of the left eye of 15 degrees. Ocular motility was not remarkable. There was a marked ocular nystagmus. Pupillary reactions were considered as being normal.

Examination of the fundi revealed a clear vitreous with somewhat pale optic nerveheads. The vessels were retracted toward the nasal side of the disc and retinal vessels were tortuous but not dilated. It was felt that there was some thinning of the inner layers of the retina; however, no areas of retinal detachment were seen.

Refraction in the right eye at this time measured a —15.5D. sph. and, in the left, —16.5D. sph., with no improvement in vision in either eye. Glasses were ordered and it was found that the correction had no effect on the pre-existing esotropia.

The patient was re-evaluated six months later and the refraction in the right eye was found to be —17.0D. sph. ⌒ —2.0D. cyl. ax. 180° which improved the vision to 20/40; in the left eye, —18.0D.

TABLE 1

SURVEY OF SEVEN CASES REPORTED

Case No.	Birth Weight	Gestational Age	Age First Seen	Oxygen Administration	Best Visual Acuity	Eye Findings	Remarks
1 White Male	2 lb. 2 oz.	Not known	3½ yr.	2 mo.	Toys and small objects	O.D.: Disc pale, tortuous vessels with nasal retraction, piling up of pigment inferiorly, −7.0D. sph. O.S.: Far advanced retrolental fibroplasia, left esotropia 15°	Left spastic hemiplegia
2 White Female	3 lb.	Not known	6 yr.	3 wk.	O.D., 20/40 O.S., 20/70	Ocular nystagmus, left esotropia, nerveheads pale, retina thin, vessels tortuous and retracted nasally. O.D.: −16.0D. sph. ⊂ −3.0D. cyl. ax. 150° O.S.: −20.0D. sph. ⊂ −2.0D. cyl. ax. 150°	None
3 White Female	2 lb. 10 oz.	Not known	1 yr.	Not known	O.D., 20/80 O.S., 20/20	Weakness of right and left lateral gaze, right esotropia, normal fundi. O.D.: −7.5D. sph. O.S.: −7.0D. sph.	Umbilical hernia
4 Negro Female	Just under 5 lb.	5 wk. premature	7 yr.	Not known	O.U., 20/20	Normal eyes O.D.: −3.5D. sph. ⊂ −0.5D. cyl. ax. 150° O.S.: −2.5D. sph. ⊂ −2.0D. cyl. ax. 100°	Normal child
5 White Male	3 lb.	2½ mo. premature	5 mo.	7 wk.	Not obtainable	Nystagmus, chalky discs, paresis upward gaze, retinal thinning. O.D.: −10.0D. sph. ⊂ −4.0D. cyl. ax. 15° O.S.: −13.5D. sph.	Double hemiparesis
6 White Female	2 lb. 5 oz.	1 mo. premature	4 yr.	2 mo.	Not obtainable	Nerveheads small and pale, nasal retraction of attenuated retinal vessels, gliosis left nervehead. O.U.: −3.0D. sph. ⊂ −2.0D. cyl. ax. 180°	Normal child
7 White Female	3 lb.	Not known	3 yr.	2 mo.	20/40−	Eyes divergent. Far advanced retrolental fibroplasia, O.D. O.S.: Disc atrophic, neovascularization near disc. −0.5D. sph. ⊂ −2.0D. cyl. ax. 180°	Normal child

sph. ⊂ −2.0D. cyl. ax. 150° which improved the vision to 20/200.

Re-examination six months later revealed the refraction in the right eye to be −16.0D. sph. ⊂ −3.0D. cyl. ax. 180°; in the left eye, −20.0D. sph. ⊂ −2.0D. cyl. ax. 150°, which improved the vision to 20/70 minus. Full correction was ordered and tolerated well. It was found to have no effect on the esotropia of the left eye.

CASE 3

A white female, with a birth weight of two lb. 10 oz., was delivered as a cephalic; no forceps were used, although there was a prolapse of one of the hands. It could not be ascertained whether the child had received oxygen following the delivery.

When the child was first seen, physical examination revealed a normal child excepting for a small umbilical hernia. Eye examination at the age of one year revealed an esotropia of the right eye of 35 degrees. Ocular rotations showed some weakness of lateral gaze to the right and to the left. The fundi were considered to be normal. Cycloplegic refraction revealed an error in the right eye of −4.0D. sph. ⊂ −5.0D. cyl. ax. 180°; in the left eye, −4.0D.

sph. ⊂ −4.0D. cyl. ax. 180°.

The child was re-examined two years later at the age of three years and the degree of myopia was found to be exactly the same. At the age of four years, the refractive error in the right eye measured −5.25D. sph. ⊂ −1.25D. cyl. ax. 180°; in the left eye, −5.0D. sph. ⊂ −1.25D. cyl. ax. 180°.

The child was re-examined at the age of six, seven, eight, and nine years and the refraction was found to be essentially the same. At the age of 10 years refraction of the right eye was found to be a −7.5D. sph.; left eye, −7.0D. sph. The visual acuity obtainable in the right eye was 20/80; in the left eye 20/20.

Examination of the ocular muscles at this time revealed that, with correction, the eyes were cosmetically straight although, without correction, there was found to be an alternating esotropia of five degrees with an alternating hyperphoria. There was also found to be some weakness of right and left lateral gaze as evidenced by ataxic movements on right and left lateral gaze of both eyes.

Case 4

The birth weight of this Negro female, born five weeks prematurely, was just under five pounds. It was not known whether oxygen had been administered following delivery.

Physical examination revealed an essentially normal child. Examination of the eyes revealed essentially normal external and fundus findings. The child was first seen at the age of seven years when the refraction in the right eye measured −1.5D. sph. ⊂ −1.25D. cyl. ax. 90°, with the same in the left eye. Visual acuity was 20/20 in each eye.

At the age of eight years the refraction measured −2.0D. sph. ⊂ −1.5D. cyl. ax. 90° in the right and in the left eyes.

At the age of 13 years refraction of the right eye measured −3.5D. sph. ⊂ −0.5D. cyl. ax. 150°; in the left eye −2.5D. sph. ⊂ −2.0D. cyl. ax. 180°.

At the age of 14 years the refraction was essentially unchanged and the visual acuity measured 20/20 in each eye.

Case 5

This white male infant, whose birth weight was three lb. four oz., received oxygen for seven weeks after delivery. He was born two and one-half months prematurely.

The patient was first seen at the age of five months when the external examination was normal, excepting for an alternating convergent strabismus of approximately 15 degrees. The fundi showed some pallor of the optic nerveheads which at this time was considered physiologic and there was some nasal retraction of the retinal vessels. Refraction in the right eye at this time measured −0.75D. sph.; the same in the left eye. The child was normal in other respects excepting for a double hemiparesis resulting from cerebral hemorrhage at the time of delivery.

Refraction at the age of 20 months was −5.0D. sph. ⊂ −2.0D. cyl. ax. 180° in the right eye; left eye, −9.0D. sph. ⊂ −1.0D. cyl. ax. 180°. At this time there was an esotropia of the left eye of 15 degrees with bilateral underaction of the external recti, most marked on the left side, and with some paresis of upper vertical gaze. The angle of squint was unimproved with glasses. The optic discs were chalky white and there was an ocular nystagmus. It was felt also that there was some thinning and atrophy of the retina. Visual acuity was not obtainable.

At the age of six years, refraction of the right eye measured −10.0D. sph. ⊂ −4.5D. cyl. ax. 15°; left eye, −13.0D. sph. The ocular findings were essentially unchanged and, again, the visual acuity was not obtainable.

Case 6

This white female, whose birth weight was two lb. five oz. and who received oxygen for two months after delivery, was thought to have been born at the eighth fetal month. The mother was informed while in the hospital that something was wrong with the child's eyes. The child was first seen at the age of four years when physical examination was essentially normal. Visual acuity was not obtainable. External examination revealed the eyes to be of normal size; corneas, anterior chambers, irises, and lenses were normal.

Examination of the fundi revealed the vitreous to be clear, with small nerveheads which were paler than normal. There was some nasal retraction of the retinal vessels which appeared somewhat attenuated. There was some abnormal glial tissue overlying the left nervehead. The refraction in both eyes measured a −3.0D. sph. ⊂ −2.0D. cyl. ax. 180°.

Case 7

This white male, whose birth weight was three pounds, had received oxygen for two months following delivery. He was in good physical condition when first seen at the age of three years. The right eye showed a far advanced retrolental fibroplasia. Both eyes were divergent. The left eye was normal externally and the fundus showed a clear vitreous. The disc was atrophic with an adjacent mass of vascular tissue at the 5-o'clock position. Refraction of the left eye at the age of three years was a −4.0D. sph.; at age of five years, −1.0D. sph. ⊂ −1.5D. cyl. ax. 15°; at seven years, −2.0D. cyl. ax. 15°; at eight years, −0.5D. sph. ⊂ −2.0D. cyl. ax. 180°. The vision could be improved to 20/40.

Summary and Conclusion

There are mild or abortive forms of retrolental fibroplasia which may give rise to a multiplicity of ocular signs, among which is a myopia, referred to as the myopia of prematurity.

Seven cases of retinopathy of prematurity are reported. In five of these cases the

birth weight was under three pounds; in the remaining two the birth weights were three lb. four oz., and five lb. In only three cases was the approximate gestational age known; these were six and one-half, seven and three-fourths, and eight months, respectively.

The final visual acuity ranged from seeing small objects and toys to 20/20. The ocular findings included: nystagmus, esotropia, paresis of lateral gaze, paresis of vertical gaze, pallor and atrophy of the nerveheads, reduced size of the nerveheads, gliosis of the nervehead, nasal retraction of the retinal vessels, dilatation of the retinal vessels, attenuation of the retinal vessels, piling up of retinal pigment, retinal thinning and atrophy, and neovascularization of the retina.

Three of these cases demonstrated an esotropia and in only one of these did glasses give any cosmetic improvement in the angle of the strabismus. In one case, the eyes were divergent and the objective angle of squint was unimproved with correction.

In two of these cases, one eye was blind, with a far-advanced degree of retrolental fibroplasia, whereas the opposite eye merely showed myopia of prematurity.

Except for one child with umbilical hernia, one with a left spastic hemiplegia, and a third with bilateral spastic hemiplegia thought due to cerebral hemorrhage at the time of delivery and perhaps enhanced by an immature cerebral vascular tree, these seven children were normal physically and mentally.

303 East Chicago Avenue (11).

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RECENT ADVANCES IN OCULAR SUTURES*

Bernard Kronenberg, M.D.
New York

The purpose of this paper is to review our basic knowledge of suture materials and needles and to summarize recent innovations. Ophthalmic surgeons use a great many types of sutures. Because sutures are so common place, the surgeons may not be as well acquainted with the advances and changes which have taken place.

The two most common suture materials used in ophthalmology are silk and catgut. Human hair, nylon, and cotton have also been used. Each of these materials has advantages and disadvantages.

Silk is preferred by many surgeons because of its inert nature. However, it has the disadvantage, particularly in cataract surgery, that the sutures must be removed. Silk is available in two forms, twisted or braided. It is also either capillary or noncapillary. Capillary is so named because body fluids can pass through the strands and the strands can absorb moisture. Noncapillary of course has the opposite properties. It does not permit passage of fluid through its strands so that the possibility of infection is reduced.

Twisted silk is stronger than braided silk, but it can untwist and leave some of its fibers in the tissues. Braided silk can broom

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and thus become difficult to thread. Braided silk is treated with wax which further prevents the absorption of fluids into the fibers, so that the suture cannot act as a wick for body fluids and as a channel for transmission of infections. Waxing also reduces fraying of the sutures and improves passage of the suture through the tissues. Because of these reasons most surgeons prefer braided or noncapillary silk.

Silk is sterilized by autoclaving, by dry heat, and also by the use of gas, such as ethylene oxide, because most chemicals do not reach the interspaces between the threads and are not sporocidal. Silk is best used in a dry form; wet silk loses 15 percent of its strength.

The dyes used in preparing silk sutures are also of interest. By law, certified dyes, such a logwood type vegetable dye, must be used in making silk sutures. Because of this the range of colors is limited. Studies are also under way to determine whether any new dyes are carcinogenic.

The nomenclature of the size of sutures was for a long time very confused. Recently most manufacturers with the help of the U.S.P. have standardized these sizes. The U.S.P. specifications allow a certain amount of latitude in the width for each size. Manufacturers attempt to keep each size uniform.

Silk is manufactured in sizes from 7-0 to No. 5; 7-0 is about the diameter of human hair, or 0.002 inches; No. 5 is about the diameter of lead in a pencil or 0.032 inches. The diameter of a suture is very important because the tensile strength is in direct mathematical relationship to diameter. However, small variations in size mean large variations in tensile strength as shown in the chart (fig. 1).

Absorbable sutures, known as catgut, have become more important in ocular surgery in recent years. However, catgut is really a misnomer because all gut sutures are made from sheep or beef intestines.

Catgut is used either as plain, which means it has not been treated to resist digestion, or as chromic. If a greater resistance to digestion is required, the material has to be "tanned." This is accomplished by treating the material with chrome salts. There are two methods of chromicizing gut. One is called "ribbon-chromicizing." Here the ribbon of gut is chromicized before the suture is fashioned. It results in uniform chrome content throughout the ribbon. In the other method, the suture is first fashioned and then a chromicizing process is applied. This results in a chromicized surface and an untreated core. There are advantages and disadvantages to both methods. The surgeon must decide which type of absorbable sutures he prefers.

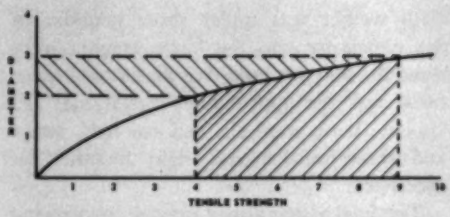

Fig. 1 (Kronenberg). Small variations in size mean large variations in tensile strength. (Reprinted with permission from a large manufacturer of sutures.)

The amount of tanning determines the degree of resistance to digestion. The chemical union of the chrome salts with the protein of the gut enables the suture material to resist the digestive effect of the body fluids. The more chrome salts present in the strand, the slower the absorbability of the catgut.

It is important to mention that the patient's physical and metabolic conditions play an important role in absorption. For instance vegetarians absorb catgut much faster than meat eaters. Locally applied ointments, as well as steroids systemically and locally, retard the absorption of gut. It is, therefore, not possible to determine the exact number of days a specific catgut suture will resist digestion in different patients; chromicized sutures can no longer be referred to as 15- or 20-day catgut, but rather as plain, mild chromic, medium chromic, or

extra chromic. The most commonly used chromic material for ocular surgery is mild chromic with an approximate rate of absorption of 15 days.

Catgut sutures are sterilized by a heat process and one of the leading suture manufactures uses a newly devised electron-beam technique. They are manufactured in size 6-0 to No. 3. Catgut sutures are available in boilable or nonboilable containers. Most of the catgut manufactured is nonboilable. Under no circumstances should nonboilable material be boiled because the protein in the suture is broken down.

In manufacturing catgut sutures, an attempt is made to remove by chemical means as much of the noncollagenous material as possible. Allergic reactions to catgut may be due to the impurities present. The higher the collagen content of catgut sutures, the less frequent the reactions. Also the tensile strength of catgut sutures is increased by a higher content of collagen.

A uniform tensile strength is important in catgut sutures, especially for tying a knot. As one becomes accustomed to a certain suture and its tensile strength, one learns how much pull to exert on the suture material. If the tensile strength is not uniform, a suture may be torn at a very critical point. If material of uniform tensile strength is obtained, one can use a suture of smaller diameter and thus have less tissue reaction.

Cotton has also been used in ocular surgery. It is particulary good if sutures are to be buried.

Nylon is another useful suture material. It is stronger than silk but has the disadvantage of stretching and the knots can slip very easily; however, braided nylon may not have this disadvantage.

The suture of the future may be Dacron. It has all the advantages of silk without the disadvantages of nylon.

Whatever the suture material used the character of the needle is of great importance. Two kinds of needles are available: (1) the eyed needles, which must be threaded to be used; (2) the eyeless needles, also known as swagged needles with suture material already attached.

Whether the needle is eyed or eyeless, certain characteristics, such as the quality of the steel, the sharpness of the needle, the curvature and the shape of the point, must be considered. The needle is usually made of steel. How the steel is tempered will determine the brittleness of the needle. A good quality needle should not be too brittle and one should be able to bend it if necessary.

Another consideration is the sharpness of the needle. A needle can never really be too sharp; the sharper the needle the less trauma to the tissues.

The two most popular needle curvatures are the one-half-circle needle and the three-eighths-circle needle. The one-half-circle needle is valuable if the surgical area is so confined that a proper follow-through cannot be accomplished with the larger needle. Also the one-half-circle needle is used where a greater depth of the bite of the tissue is required. A three-eighths-circle needle, on the other hand, is used where a shallow, yet long, bite of tissue is desired. For skin surgery a half-curved needle can be used.

The shape of the needle point can either be tapered, also known as round bodied, or can have a sharp cutting edge. Basically, the taper needle is used for soft pliable tissues; the cutting edge for tough hard tissues.

The cutting-edge needle has a triangular shape and has been produced with the apex upward and also with the apex downward. The apex upward had the disadvantage of cutting through the tissues as the needle was removed. It was then thought that it would be better to have the apex down, but this too had the disadvantage of cutting down too much. An ideal shape would, therefore, have to be one which splits the tissues but does not cut up or down. It should be sharp and make a track sufficient for the passage of the suture material. Such needles for ocular surgery are now in the process of development by several major manufacturers.

The distance of the cutting edges along

the needle can modify its effectiveness. If they are carried back all the way along to the end of the needle, the suture may tear through completely. Also the needle may not fit in some needleholders.

The handling of sutures can be of great importance in the results obtained. When the tube is removed from the jar, it must be carefully rinsed because it is immersed in an alcohol-formaldehyde sterlizing solution. If this solution gets into the eye, it can cause an inflammatory reaction. Both in opening and removing the sutures from the tube care must be taken not to damage the sutures with the glass. The suture can be hurt when unwinding from the reel. New methods of packaging sutures in plastic envelopes will, in the near future, eliminate this problem.

Before proceeding to a specific discussion of the sutures and needles commonly used by ophthalmologists, a few remarks should be made on wound healing. The tensile strength of a closed wound is equal to the amount of tissue strength plus that of a suture. On the day of operation the strength of the tissues is zero. The suture is the only thing that holds the wound together. For about three days the wound has no strength; as the tissue heals, the wound strength increases. The critical period is between the fourth and seventh day. It is during this period that the wound is most susceptible to strains and can rupture. Therefore, when catgut is used, the rate of absorption should certainly be not less than seven days (fig. 2).

For cataract surgery, the major suture companies have prepared both silk and mild chromic surgical gut in sizes from 4-0 to 7.0, single- or double-armed. Available are the tapered as well as the cutting edge and the inverted edge. The same materials are used for corneal surgery.

An "eyed" needle by a Swiss manufacturer is extremely popular with many surgeons for cataract surgery. It is available in plain steel and stainless steel, in 7.0-mm. and 10-mm. lengths. There are also two kinds of cutting edges: (1) conventional with the

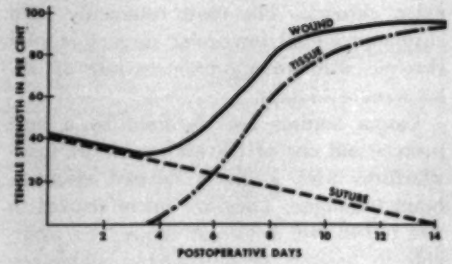

Fig. 2 (Kronenberg). Strength of operated wounds. (Reprinted from Joergenson and Smith: Am. J. Surg., **2**:282 (Feb.) 1950.)

apex of the triangle in front, and (2) a flat needle with the cutting edges on the side. This needle can be threaded with the material chosen by the surgeon. Of course the track formed is larger than the suture material and the needle itself must be sharpened after a certain time. The swagged needle, if it is properly made, eliminates this problem.

Cotton, silk, and nylon have been used for scleral surgery. Since these sutures are usually buried one must be sure that the material will remain inert.

For muscle surgery both plain and mild chromic catgut, single- and double-armed sutures are manufactured. It is here that the type of needle used is most important. The sclera is thin and an imperfect needle or a too fine suture can cut through the tissues.

A new sharp small one-half-circle needle with mild chromic catgut is being used for dacryocystorhinostomies. It works very efficiently but is expensive.

Plastic procedures on the eyelids usually do not require any special type of needles. The material used is usually silk or nylon 5-0 to 6-0 with either a tapered needle or a cutting-edge needle.

In the final analysis the surgeon must decide what type of material and needle he prefers for any of the procedures he must do. With the variety of available material, surgery should be made easier and more efficient.

737 Park Avenue (21).

THE USE OF HYPNOSIS IN SUPPRESSION AMBLYOPIA OF CHILDREN*

CARROLL W. BROWNING, M.D., LESTER H. QUINN, M.D., AND HAROLD B. CRASILNECK, PH.D.

Dallas, Texas

In a pilot study of the effects of hypnotic suggestion upon nine adult patients with suppression amblyopia,† sufficient improvement in near-vision performance was obtained in five patients to encourage a continuation of the study in children.

In the present study, hypnosis was attempted on 19 children, aged five to 15 years. All of the children showed established suppression amblyopias of varying degrees. They provided a mixed study group of strabismic, nonstrabismic, anisometropic, and isometropic subjects.

The procedure of study and control, the standards of vision testing, and the effects of hypnosis upon visual acuity of the amblyopic eye are reported.

I. CONDITIONS OF THE EXPERIMENT

A. PATIENT GROUP

1. Nineteen children, aged five to 15 years, were studied.

2. The group was heterogenous and included strabismic, nonstrabismic, anisometropic, and isometropic patients.

B. STANDARDS FOR VISION TESTING

The visual acuity test most convenient to the conditions of the hypnosis studies was the near-vision test. No special attempt to improve distance vision with hypnotic suggestion was made, although interval tests for distance vision change were made in the ophthalmologist's office. The following standards for visual acuity testing were established.

1. Each patient had a complete ocular physical examination, including orthoptic evaluation and cycloplegic refraction, prior to the study. Best near and distance vision were recorded by the ophthalmologist.

2. All patients were given their appropriate lens corrections which were not changed during the investigation.

3. The patient was never allowed to use the good eye in viewing the near test cards used for the amblyopia studies. The good eye was occluded prior to entering the examination room. This precaution excluded memory as an aid for visual improvement in the amblyopic eye.

4. The child's head was placed in a chin-rest and the reading card was placed constantly at the appropriate test distance for the particular near-vision test card in use.

5. The near-vision test cards used were:

a. American Optical test card #1996 (illiterate E card constructed on reduced Snellen principles).

b. Bausch & Lomb reduced Snellen card #H-452 3, V-55.

c. American Optical word test card #1984.

6. A windowless room was used providing a constant artificial light source in a constant position, and at a fixed distance from the patient.

7. Near vision was taken immediately before and after hypnosis.

C. STANDARDS OF CONTROL

1. Optical factors were kept constant throughout the experiment—no lens change was made during the study. All children, except Patient 2, had worn their correction for at least one month prior to starting the study.

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* From the Division of Ophthalmology of the Department of Surgery and the Department of Psychiatry, The University of Texas, South-Western Medical School.

† Browning, C. W. and Crasilneck, H. B., "The Experimental Use of Hypnosis in Suppression Amblyopia," American Journal of Ophthalmology, Vol. 44, No. 4 (Part I), p. 468, October 1957.

2. No squint surgery was performed on any of the hypnotizable patients during the period of study.

3. No orthoptic training was given to the patients during the study. Patient 5, A. H., was occluded for one week after the attainment of the best possible vision with hypnosis to evaluate the additive effects of hypnosis and occlusion.

4. Preliminary near-vision tests were given repeatedly to each hypnotizable child for a control, to see if significant single session vision gains could be produced in the amblyopic eye by ordinary persuasion techniques. Considerable time was spent with each patient, attempting to improve vision with simple encouragement before hypnosis.

5. All nonhypnotizable children were relegated to a control group for observation of:

a. The average fluctuation in visual acuity of the amblyopic eye during the period study.
b. The improvement effects of simple persuasion upon the visual acuity of the amblyopic eye.

D. Hypnosis study session

At all study sessions considerable time was spent in preliminary nonhypnotic persuasion in an attempt to improve the vision in the amblyopic eye. Following the establishment of the patient's best visual performance under simple encouragement techniques, an attempt was made to hypnotize the patient to a somnambulistic state.

Under hypnosis suggestions were made in varied forms that the child would be able to see clearly with the amblyopic eye. All hypnotic suggestion given was of a positive nature, and at no time was the patient's amblyopic disability acknowledged. All vision testing was done after the patient had been completely removed from his state of hypnotic induction. No "age regression" techniques were used to enhance plasticity of response in this patient group.

Nine of the 19 children studied were hypnotizable to a somnambulistic state. The nonhypnotized and hypnotized children were divided into two study groups: II. Nonhypnosis control group; III. hypnosis study group.

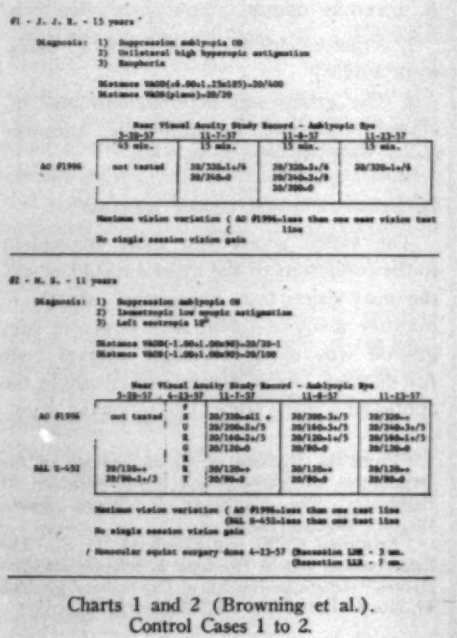
II. Control group study—nonhypnosis

A preliminary control evaluation was made of the possible vision gain effects of nonhypnotic persuasion upon each of the hypnosis patients before they were hypnotized. In addition to the prehypnosis control observations made upon the nine hypnotizable patients, the 10 children (charts 1 to 10) that could not be hypnotized were designated as a control group for study of:

1. The normal fluctuations of the near vision of the amblyopic eye occurring during a time interval comparable to the period of the hypnosis study.

2. The possible vision gain obtainable by simple nonhypnotic suggestion and persuasion.

The following principles were observed in the control studies:



Charts 1 and 2 (Browning et al.).
Control Cases 1 to 2.

#3 - F. N. - 9 years

Diagnosis: 1) Suppression amblyopia OS
2) Esomatropic hyperopic astigmatism
3) Accommodative esotropia

Distance VA(D)(+4.00+1.50x90)=20/25
Distance VA(S)(+4.00+1.50x90)=20/50

Near Visual Acuity Study Record - Amblyopic Eye

	4-1-57	4-3-57	4-9-57	11-7-57	11-13-57
AO #1996	not tested	not tested	not tested	20/40-3+/3 20/30-0	20/160-4+/3 20/120-1+/3 20/80-0
Bell B-452	20/80-+ 20/60-0	20/120-+ 20/80-1+	20/80-+ 20/60-1+	20/120-+ 20/80-0	20/120-+ 20/80-0
AO #1996	1.25M-most words 1.00M-0	1.25M-+ 1.00M-0	1.25M-+ 1.00M-few words	1.25M-+ 1.00M-0	1.25M-only scattered words

Maximum vision variation (AO #1996-two full test lines
(Bell B-452-one full test line
(AO #1996-one test paragraph unit
No single session vision gain

#4 - B. Cr. - 11 years

Diagnosis: 1) Suppression amblyopia OS
2) Hyperopic anisometropia with astigmatism
3) Partially accommodative right esotropia (15° with P.C.
(25° without P.C.

Distance VA(D)(+5.50+1.75x110)=20/160
Distance VA(S)(+4.75+1.00x50)=20/30

Near Visual Acuity Study Record - Amblyopic Eye

	4-9-57	11-9-57	11-13-57
AO #1996	not tested	20/200-+ 20/160-0	20/240-3+/3 20/200-2+/3 20/160-1+/3
Bell B-452	20/120-+ 20/80-0	20/120-+ 20/80-0	20/200-+ 20/120-0

Maximum vision variation (AO #1996-approximately 2/3 of one test
(line
(Bell B-452-one full test line
No single session vision gain

#5 - G. K. - 9 years

Diagnosis: 1) Suppression amblyopia OS
2) Low hyperopia
3) Left esotropia 5°

Distance VA(D)(+1.00S)=20/30
Distance VA(S)(+1.00S)=20/100-1

Near Visual Acuity Study Record - Amblyopic Eye

	4-17-57	11-7-57	11-13-57
AO #1996	not tested	20/120-2+/3 20/80-1+/3 20/60-0	20/160-3+/3 20/120-0
Bell B-452	20/120-+ 20/80-0	20/120-+ 20/80-0	20/200-+ 20/120-0

Maximum vision variation (AO #1996-one full test line
(Bell B-452-one full test line
No single session vision gain

#6 - H. H. - 6 years

Diagnosis: 1) Suppression amblyopia OS
2) Hyperopia OD, low myopic astigmatism OS with anisometropia
3) Left esotropia 45°

Distance VA(D)(+1.25S)=20/30
Distance VA(S)(-1.50+1.00x140)=20/200

Near Visual Acuity Study Record - Amblyopic Eye

	4-22-57	11-7-57	11-9-57	11-13-57
AO #1996	20/120-+ 20/80-0	20/120-4+/3 20/80-0	20/160-3+/3 20/120-0	20/200-3+/3 20/160-0
Bell B-452	not tested	20/200-+ 20/120-0	20/200-+ 20/120-0	20/200-+ 20/120-0

Maximum vision variation (AO #1996-two full test lines
(Bell B-452-none*
No single session vision gain

* Near reading test card Bell B-452 has no 20/160 test line.

Charts 3 to 6 (Browning, et al.). Control Cases 3 to 6.

#7 - B. O. - 7 years

Diagnosis: 1) Suppression amblyopia OS
2) Mixed astigmatism with anisometropia
3) Left esotropia

Distance VA(D)(-0.25+2.50x180)=20/30
Distance VA(S)(-2.25+4.00x87)=20/200

Near Visual Acuity Study Record - Amblyopic Eye

	4-22-57	11-14-57	11-13-57	11-23-57
AO #1996	20/200-0	20/320-4+/3 20/240-3+/3	20/320-4+/3 20/160-0	20/320-0
Bell B-452	20/200-0	20/200-+ 20/120-0	20/200-+ 20/120-0	20/200-+ 20/120-0

Maximum vision variation (AO #1996-almost one test line
(Bell B-452-one full test line
No single session vision gain

#8 - J. McL. - 13 years

Diagnosis: 1) Suppression amblyopia OD
2) Hyperopic anisometropia
3) Right esotropia 25°

Distance VA(D)(+4.50+0.25x90)=20/300
Distance VA(S)(+1.50+0.25x90)=20/20

Near Visual Acuity Study Record - Amblyopic Eye

	4-18-57	4-24-57	11-7-57	11-8-57	11-13-57
	45 min.	9 8	13 min.	15 min.	15 min.
AO #1996	20/80-+	9 8	20/160-4+/3 20/120-0	20/160-3+/3 20/120-0	20/160-3+/3 20/120-0
Bell B-452	not tested	6 5	20/200-+ 20/120-0	20/200-+ 20/120-0	20/200-+ 20/120-0
		7			

Significant vision difference between pre and post surgery visions
(two full test lines)
Postoperative vision variations-less than one test line
No single session vision gain

† Monocular esotat surgery done 4-24-57 (Recession MMR - 5 mm.
(Resection MLR - 8 mm.

#9 - C. H. - 9 years

Diagnosis: 1) Suppression amblyopia OS
2) Hyperopic, antimetic anisometropia
3) No strabismus

Distance VA(D)(+1.00+0.25x90)=20/20-1
Distance VA(S)(+4.25+3.00x90)=20/200

Near Visual Acuity Study Record - Amblyopic Eye

	7-2-57	7-10-57	11-9-57	11-13-57
AO #1996	not tested	*20/160-+ 20/120-+	20/160-3+/3 20/120-0	
Bell B-452	20/120-1+/3	not tested	20/200-+ 20/120-0	20/200-+ 20/120-0

Maximum vision variation (AO #1996-one full test line
(Bell B-452-one-half test line
*Single session vision gain of one line on AO #1996!

#10 - D. C. - 6 years

Diagnosis: 1) Suppression amblyopia OD
2) Right esotropia 10°, right hypertropia 10° with right superior
oblique contraction and left inferior rectus paresis

Distance VA(D)(+1.00)=20/200
Distance VA(S)(+1.25)=20/30

Near Visual Acuity Study Record - Amblyopic Eye

	11-7-57	11-9-57	11-13-57
AO #1996	20/320-3+/3 20/240-0	20/320-1+/3 20/240-0	20/320-1+/3
Bell B-452	20/200-0	20/200-0	20/200-0

Maximum vision variation (AO #1996-nil
No single session vision gain

Charts 7 to 10 (Browning, et al.). Control Cases 7 to 10.

1. All vision testing standards and constants as set forth for the hypnosis patient group were observed.

2. The time allotment made for each control study session was equal to, or greater than, the hypnosis study session. A variety of persuasion tactics and reward stimuli were provided for each child.

3. Vision testing results from previous sessions were not available to the examiner prior to the control study session.

In the control group of 10 patients (charts 1 to 10) where attempts were made to improve near vision by persuasion without hypnosis, only one patient (9) showed a single session vision gain of one full test line. All of the remaining patients showed lesser or no single session gains in acuity of the amblyopic eye.

Seven of the 10 patients showed interval variations in near vision of one full test line on different examination days. Three of the patients showed interval near vision variations of as much as two full test lines from session to session. (One of these patients [8] underwent squint surgery between the two sessions showing maximum visual acuity difference.)

III. Report of cases—hypnosis group

Case 1

L. D., a boy, aged nine years. The patient's parents first became aware of a visual deficiency in the child's left eye following a school eye examination at eight years of age. No history of a turned eye in the patient, his siblings, or parents. The patient saw an ophthalmologist one year ago who prescribed glasses and recommended full-time occlusion of the right eye. Full-time occlusion was done for two weeks and then only intermittently because of the patient's wish to discontinue patching and the complaints of inconvenience.

Prestudy vision tests. On March 30, 1956, vision was: O.D., with a +2.75D. sph., 20/25; O.S., with a +3.75D. sph. $\bigcirc$ +0.25D. cyl. ax. 180°, 20/70. Cycloplegic: O.D., +4.75D. sph.; O.S., +6.0D. sph. On April 26, 1956, vision, O.S., with a +4.25D. sph., was 20/50—2. On December 18, 1956, vision, O.S., with a +3.25D. sph., was 20/50; not improved with pinhole. Near vision with the best correction, O.S., did not permit patient to read more than a few words on the 1.25 m. line of chart AO#1984. No letters were read on the 1.0 m. line at 15 inches. On March 11, 1957, vision, O.S., with a +3.25D. sph., was 20/50. Near vision with the best correction was a few words on the 1.25 m. line with a +5.0D. lens, O.S. No words were read on the 1.0 m. line of chart AO#1984 at 15 inches.

Ocular motility examination. Corneal light reflexes were perfectly centered in primary position with no manifest tropia. Extraocular movements in cardinal fields were normal. The near-point of convergence was good with reduced hyperopic correction. Maddox rod: rotary prism measurements showed seven prism diopters of exophoria for near, and one prism diopter of exophoria for distance. Worth-four-dot test was positive. Patient showed peripheral stereopsis on the American Optical fly test. Troposcope studies showed perimacular fusion at zero angle for distance, and at five prism diopters exophoria for near. Grade II fusion was present with 12 prism diopters of convergence amplitude for distance, and eight prism diopters of convergence amplitude for near. Patient showed gross target stereopsis. Diplopia tests with red glass and vertical prism showed vertical diplopia and normal retinal correspondence. There was normal retinal correspondence on the after-image test.

Ocular physical examination. The external examination is entirely normal. Biomicroscopy showed clear corneas, lenses, and anterior vitreous, O.U. The fundus visibility was 20/20 in both eyes. The discs were normal with temporal nerve shelves of three to four disc vessel diameters. There was a one-plus venous pulsation bilaterally at the disc. The maculas were normal, with positive foveal light reflexes present bilaterally. The peripheral fundus and retinal vessels were normal, O.U.

Diagnosis. (1) Suppression amblyopia, O.S.; (2) hyperopic anisometropia; (3) exophoria with no strabismus.

Hypnosis visual acuity studies are given in Table 1. This patient obtained a significant improvement in both distance and near vision during the period of study. The physician-patient contact time required to attain peak near vision was 90 minutes. The total time between start of study and peak near-vision attainment was 18 days.

Case 2

S. P., a girl, aged 11 years. Her parents first became aware of poor vision in right eye following failure to pass a school eye examination at the age of 11 years. One brother has an internal strabismus but good vision in each eye. There was no history of deficient one-eyed vision in parents or relatives.

Prestudy vision tests. On March 21, 1957, cycloplegic refraction showed: O.D., +4.0D. sph. $\bigcirc$ +2.25D. cyl. ax. 75°; O.S., +2.25D. sph., 20/20. Vision was: O.D., with a +1.75D. sph. $\bigcirc$ +2.25D. cyl. ax. 75°, 20/60, not improved with pinhole; O.S., with a +0.25D. sph., 20/20. Near-vision test with the best correction, O.D. (+4.0D. sph. $\bigcirc$ +2.25D. cyl. ax. 75°), showed the patient could read most of the 1.0 m. words at 15 inches on the AO#1984 chart.

TABLE 1

CASE 1: HYPNOSIS VISUAL ACUITY STUDIES OF AMBLYOPIC EYE

Session	Date	Prehypnosis	Posthypnosis
#1	3-13-57		
	AO #1996	20/120 all letters correct 20/80 missed 2 letters	20/80 all letters correct 20/60 missed 2 letters
	AO #1984	1.25m scattered words only	1.25m all words correct 1.00m all words correct 0.75m scattered words only (single session improvement)
#2	3-20-57		
	AO #1996	20/60 all letters correct 20/40 missed 2 letters 20/30=0	20/60 all letters correct 20/40 missed 4 letters 20/30=0
	AO #1984	1.25m all words correct 1.00m all words correct	1.25m all words correct 1.00m scattered words only
#3	3-28-57		
	AO #1996	20/60 only 2 letters correct	20/40 all letters correct
	AO #1984	1.00m all words correct	0.75m all words correct (single session improvement)
#4	4-1-57		
	AO #1996	20/60 all letters correct 20/40 only 2 letters correct	20/60 all letters correct 20/40 only 2 letters correct
	AO #1984	0.75m scattered words	0.75m scattered words only
#5	4-9-57		
	AO #1996	20/60 all letters correct 20/40 only 2 letters correct 20/30 only 2 letters correct	20/60 all letters correct 20/40 all letters correct 20/30 all letters correct
	AO #1984	1.00m all words correct 0.75m=0	1.00m all words correct 0.62m all words correct (single session improvement)
	4-25-57—No hypnosis used—doctor's office Distance VAOS with +3.25S=20/30 AO #1984 Near VAOS=0.75m all words complete at 15"=0.62m reads scattered words		
#6	5-28-57 Follow up #1 (6 weeks post last hypnosis session)		
	B&L H-452	20/40 all letters correct 20/30=0	20/30 3 of 5 letters correct
#7	7-24-57 Follow up #2 (2 months post last hypnosis session)		
	AO #1996	20/30 all letters correct	20/30 all letters correct

She was unable to read any letters or words on the 0.75 m. line. On March 23, 1957, the best distance vision, O.D., with a +1.75D. sph. ⌒ +2.25D. cyl. ax. 75°, was 20/60, not improved with pinhole. With the AO #1984 chart at 15 inches, near vision O.D., with a +4.0D. sph. ⌒ +2.25D. cyl. ax. 75°, the patient could read the 1.0 m. letters. She could not read letters on the 0.75 m. line.

Ocular motility examination. The corneal light reflexes were well centered in the primary position. No tropia was present. The extraocular movements in the cardinal fields were normal. The after-image test and diplopia test with red glass and vertical prism both showed normal retinal correspondence. Worth-four-dot test showed fusion for near. Troposcope studies showed fusion Grade II with gross

stereopsis. Amplitude of Grade II fusion equaled 18 prism diopters convergence for distance, and 18 prism diopters convergence amplitude for near. Five prism diopters of exophoria were present for distance, and four prism diopters for near. The patient showed fusion with the worth-four-dot flashlight test for near and distance.

Ocular physical examination. The external examination was normal. Biomicroscopy showed clear corneas, lenses, and anterior vitreous. The anterior chambers were deep and clear, and the pupillary light reflexes were brisk. Fundus visibility was 20/20, O.U. The discs were normal with temporal nerve shelves of four disc vessels in diameter. The maculas were normal with positive foveal light reflexes bilaterally. The peripheral fundus and vessels were normal.

Diagnosis. (1) Suppression amblyopia, O.D., (2) hyperopic, astigmatic anisometropia; (3) exophoria with no strabismus. Hypnosis studies are shown in Table 2.

This patient's near-vision improvement represented an interval, or between session, type of gain rather than single-session improvements. The prescription of a hyperopic astigmatic correction for the amblyopic eye a few days before the study began innovated the optical inconstant of new lens adjustment as a possible factor responsible for visual improvement. Visual gain in this case, therefore, cannot be presumed solely a hypnotic effect phenomenon.

Case 3

S. J. W., a girl, aged five years, was first seen on February 16, 1956, because of crossing of the left eye. No family history of strabismus could be elicited.

Prestudy vision tests. On February 16, 1956,

TABLE 2

Case 2: Hypnosis visual acuity studies of amblyopic eye

Session	Date	Prehypnosis	Posthypnosis
All tests made with +1.75+2.25×75 OD			
#1	3-25-57		
	B&L H-452 14 in.	20/60 only 1 letter correct	20/60 only 3 letters correct
	AO #1984	1.00m all words correct 0.75m = 0	1.00m all words correct 0.75m = 0
No improvement first session			
#2	3-27-57		
	B&L H-452	20/60 all letters correct 20/40 = 0	20/60 all letters correct 20/40 = 0
#3	4-3-57		
	B&L H-452	20/60 all letters correct 20/40 only 3 letters correct 20/30 only 1 letter correct	20/60 all letters correct 20/40 only 3 letters correct 20/30 only 1 letter correct
	AO #1984	1.25m all words correct 1.00m all words correct 0.75m all words correct 0.50m = 0	1.25m all words correct 1.00m all words correct 0.75m all words correct 0.50m = 0
#4	4-9-57		
	B&L H-452	20/40 only 3 letters correct 20/30 only 1 letter correct	20/40 only 2 letters correct 20/30 only 1 letter correct
	AO #1984	1.00m all words correct 0.75m all words correct 0.50m = 0	1.00m all words correct 0.75m all words correct 0.50m all words correct
	4-25-57—No hypnosis used—doctor's office Distance VAOS (+1.75+2.25×75) = 20/40 = 2		
#5	8-5-57		
	AO #1996	20/35	20/30
	B&L H-452	20/40 all letters correct	20/30 2 letters correct
	AO #1984	0.75m all words correct	0.75m all words correct
#6	9-7-57 Follow up #2		
	AO #1984	0.75m all words correct 0.62m scattered letters only	0.75m all words correct 0.62m scattered letters only

cycloplegic refraction showed: O.D., +1.25D. sph. ⌒ +1.25D. cyl. ax. 95°, 20/20; O.S., +4.5D. sph. ⌒ +1.75D. cyl. ax. 90°, 20/200. Full correction was prescribed with a two-percent over-all size correction in the right lens. On April 16, 1956, vision, O.S., with correction was 20/200; full-time occlusion of the right eye was started. On May 17, 1956, vision, O.S., was 20/70—1; on June 18th, 20/50+2. On August 15th, vision, O.S., with a +4.5D. sph. ⌒ +1.75D. cyl. ax. 90° was 20/30, with full-time occlusion. On January 3, 1957, vision of the left eye with occlusion discontinued was 20/30 with a +4.5D. sph. ⌒ +1.75D. cyl. ax. 90°. Vision of the left eye fell to 20/50 six weeks later but was again brought to 20/30 with occlusion and fell off each time occlusion was discontinued. On April 10, 1957, vision, O.S., with a +4.5D. sph. ⌒ +1.75D. cyl. ax. 90° was 20/50.

Ocular motility examination. Vision, O.S., was 20/50 with present correction. Not improved with pinhole. Hirschberg indicated approximately 10 prism diopters of esotropia with correction, and 18 prism diopters esotropia without correction. This did not vary significantly in the cardinal fields. Maddox rod showed 20 prism diopters of esotropia for distance, and 25 prism diopters for near, with three prisms diopters of right hypertropia with O.S. fixation. Multiple tests with Worth-four-dot showed fusion with occasional suppression of O.S. There was vertical diplopia with vertical prism and red glass. On the troposcope there was perimacular fusion at the angle of squint.

Ocular physical examination. The external examination was entirely normal. Biomicroscopy showed corneas, lenses, and anterior vitreous clear. Fundus visibility was 20/20, O.U. The optic discs were normal. The maculas were normal and the foveal light reflexes were clearly seen in each eye. The peripheral fundus and vessels were normal.

Diagnosis. (1) Suppression amblyopia, O.S.; (2) compound hyperopic astigmatism with anisometropia; (3) esotropia with slight right hypertropia. The hypnosis studies are shown in Table 3.

The total patient-physician contact time required for the obtainment of peak near visual acuity of 20/20—1 in this patient was one hour. Total time from start of study to obtainment of peak vision was 16 days. No improvement in distance vision was observed in a distance vision test made two days after peak near vision was obtained. In a 14-week posthypnosis follow-up session, the near visual acuity in the amblyopic eye was 20/25.

Case 4

B. L. Mc., a boy, aged seven years, was a full-term baby. His mother had pre-eclamptic symptoms (high-blood pressure and swollen feet). The patient was referred to the eye clinic because the school nurse found poor vision in the left eye.

Prestudy vision tests. On March 21, 1957, under cycloplegia, vision, O.D., with a +7.0D. sph. ⌒ +0.25D. cyl. ax. 90° was 20/25; O.S., with a +8.25D. sph., 20/60. Rx: O.D., +5.5D. sph. ⌒ +0.25D. cyl. ax. 90°; O.S., +6.75D. sph. On March 28, 1957, vision, O.D., with this prescription was 20/25; O.S., with prescription, 20/60.

Ocular motility examination. The corneal light reflexes were perfectly centered in the primary position, with no manifest tropia. The extraocular movements in the cardinal fields were normal. Near-point of convergence is seven cm. With Maddox rod there was orthophoria for distance, and six diopters of exophoria at 13 inches. The Worth-four-dot test was positive for 13 inches and eight feet. Stereopsis on the American Optical fly test was questionable. Troposcope studies showed perimacular fusion at zero angle for distance, and at six prism diopters for near. The patient showed Grade II fusion with amplitude of 30 prism diopters for distance, and 25 prism diopters for near. Stereopsis was present to gross targets. Red glass and vertical prism test showed vertical diplopia and normal retinal correspondence. The after-image test showed normal retinal correspondence.

Ocular physical examination. The external examination was entirely normal. Biomicroscopic examination showed the cornea, lenses, and anterior vitreous clear in both eyes. The fundus visibility was 20/20 in each eye. The discs had normal color, and the temporal nerve shelf was four disc vessel diameters wide. The maculas were normal with positive foveal light reflexes present. The peripheral fundus and vessels were normal, O.U.

Diagnosis. (1) Suppression amblyopia, O.S.; (2) hyperopic anisometropia; (3) exophoria with no strabismus. Hypnosis studies are shown in Table 4.

The visual improvement obtained here represented "at the session" gains, rather than "between session" gains. The improvement in distance vision was not comparable to the near visual acuity gain. The total physician-patient contact time required for attainment of best visual performance was one hour. The total time interval between the start of the study and the attainment of peak near vision was 24 hours.

Case 5

A. H., a girl, aged nine years. Her left eye began to cross at 15 months of age. An ophthalmologist prescribed glasses at the age of 18 months. Full-time occlusion was prescribed for three months at the age of three years. At the age of four and one-half years, the patient had a recession of the left internal rectus muscle. Full-time occlusion of the right eye was done for three months postoperatively, with no improvement in vision, O.S.

Prestudy vision tests. On August 24, 1956, under cycloplegia, vision was: O.D., with a +4.5D. sph. ⌒ +0.5D. cyl. ax. 90°, 20/20; O.S., with a +4.5D. sph. ⌒ +0.5D. cyl. ax. 90°, 20/160, not improved with pinhole. The patient was given a plano lens for the right eye and atropine was used in the right eye daily. On September 8th, vision, O.S., with a +4.25D. sph. ⌒ +0.5D. cyl. ax. 90° was 20/200. On October 6th with the same correction it was 20/100. By November 2nd, it was 20/80 and on December 28th it still measured 20/80 with the same

TABLE 3

CASE 3: HYPNOSIS VISUAL ACUITY STUDIES OF AMBLYOPIC EYE

Session	Date	Prehypnosis	Posthypnosis
All VAOS studies made with +4.50+1.75×90			
#1	4-10-57 AO #1996	14/28 (20/40) all letters correct 14/21=0	14/21 (20/30) all letters correct
#2	4-15-57 AO #1996	14/21=20/30 all letters correct 14/14=0	14/21=20/30 all letters correct 14/14=0
#3	4-17-57 AO #1996	14/17.5=20/25 all letters correct 14/14=2 of 5 correct	14/17.5=20/25 all letters correct 14/14=20/20−1=4 of 5 correct
	4-19-57—No hypnosis used—doctor's office Distance VAOS=20/50		
#4	8-5-57 Follow up (3½ mos.) AO #1996	14/17.5=20/25 all letters correct	20/25 all letters correct
#5	8-7-57 AO #1996	14/21=20/30 all letters correct	20/25=3 of 5 correct

correction. On December 28th, atropine to the right eye was discontinued and the patient was given the hyperopic correction for this eye. On May 3, 1957, vision in the left eye with the same correction, was 20/160 and the near vision test with the AO #1996 chart was 14/84—20/120.

Ocular motility examination. The corneal light reflex centered in the right eye was out 10 degrees temporal to the center of the cornea of the left eye. The extraocular movements in the cardinal fields were normal. A good near-point of convergence was present. Maddox rod-rotary prism measurements showed 10 diopters of esotropia for distance, and six diopters of esotropia for near. The Worth-four-dot test showed diplopia. There was normal retinal correspondence on the after-image test. There was appreciation of depth with the AO fly test. The troposcope showed perimacular fusion at the angle of squint with normal retinal correspondence.

Ocular physical examination. The external examination was entirely normal. The conjunctiva, O.S., showed the scar line of incision of previous surgery on the left internal rectus muscle. Biomicroscopic examination showed clear corneas, lenses, and anterior vitreous in both eyes. The fundus visibility was 20/20 in each eye. The discs were normal with temporal nerve shelves of four disc vessel diameters. The maculas were normal with positive foveal light reflexes bilaterally. The peripheral fundus and vessels were normal in both eyes.

Diagnosis. (1) Suppression amblyopia, left eye; (2) compound hypermetropic astigmatism; (3) esotropia. Hypnosis studies in this case are shown in Table 5.

This patient's near vision improved from 20/120 to 20/40 in two hypnosis sessions with a total physician-patient contact time of 45 minutes. A marked regression of near-vision performance oc-

TABLE 4

CASE 4: HYPNOSIS VISUAL ACUITY STUDIES OF AMBLYOPIC EYE

Session	Date	Prehypnosis	Posthypnosis
#1	4-23-57 AO #1996	14/42 (20/60) all letters correct	14/28 (20/40) all letters correct
#2	4-24-57 AO #1996	14/28 (20/40) all letters correct	14/21 (20/30) 3 of 5 correct
	4-27-57—No hypnosis used—doctor's office AO #1996 Distance	With present correction—VAOS =20/30 With present correction—VAOS =20/50	

TABLE 5

CASE 5: HYPNOSIS VISUAL ACUITY STUDIES OF AMBLYOPIC EYE

Session	Date	Prehypnosis	Posthypnosis
#1	5-13-57		
	AO #1996	20/120 all letters correct	20/80 all letters correct
		20/80 = 0	20/60 3 of 5 letters correct
#2	5-15-57		
	AO #1996	20/50 3 of 5 letters correct	20/50 all letters correct
			20/40 3 of 5 letters correct
#3	5-27-57		
	AO #1996	20/120	20/50
			Z correct on bottom line
		Marked regression over 12 days	Incomplete response to hypnosis
	Patient to have occlusion for 1 week by referring doctor		
	Patient has had occlusion for one week		
#4	6-3-57		
	AO #1996	20/35	20/35
	Occlusion discontinued		
#5	6-5-57		
	(10 min.)		
	AO #1996	20/60	20/35 3 of 5 letters correct
	Patient returned to referring doctor for strabismus surgery		
	6-14-57—No hypnosis used—doctor's office		
	VAOD (+4.50+.50×85) = 20/20		
	VAOS (+4.75+.50×100) = 20/70		

curred in a 12-day period following the second session, with a poor near-vision performance of 20/160 before hypnosis in the third session. Immediately after the third hypnosis session the best vision was 20/50. Full-time occlusion was then prescribed for one week. At the end of the week of occlusion the near vision was 20/35. Upon discontinuing occlusion the near vision dropped from 20/35 to 26/60 in two days. The near visual acuity of 20/60 was restored to 20/35 in a single final hypnosis session. The improvement in distance vision was not comparable to the quality of near-vision improvement.

CASE 6

K. T., a girl, aged seven years, had had partial occlusion in Milwaukee, Wisconsin. Other history not available.

Prestudy vision tests. On November 10, 1956, vision was: O.D., with a +2.0D. sph. ⊂ +0.75D. cyl. ax. 100°, 20/100; O.S., with a +2.0D. sph. ⊂ +0.75D. cyl. ax. 75°, 20/30. Total occlusion was started. On December 15th, with the same correction, vision was: O.D., 20/50; O.S., 20/30. By March 2, 1957, with the same correction, vision was: O. D., 20/50; O. S., 20/20; occlusion was discontinued. On May 4th, with the same correction, vision was: O.D., 20/70; O.S., 20/20.

Ocular motility examination. The Hirschberg test showed approximately five degrees of right esotropia. The extraocular movements were full and symmetrical. A good near-point of convergence was present. Depth appreciation was present for the American Optical fly test. The troposcope showed perimacular fusion at the angle of squint, with normal retinal correspondence.

Ocular physical examination. The external examination was entirely normal. Biomicroscopic examination showed clear cornea, lens, and anterior vitreous in both eyes. The fundus visibility was 20/20 in each eye. The discs were normal. The maculas were normal, with positive foveal light reflexes present. The peripheral fundus and vessels were normal in both eyes.

Diagnosis. (1) Suppression amblyopia, right eye; (2) isometropic hyperopic astigmatism; (3) Esotropia. The hypnosis survey is given in Table 6.

The patient made a remarkable near vision gain (20/160 to 20/40) in the first 30-minute hypnosis session. The patient-physician contact time required to reach peak visual acuity was 50 minutes. The total time between start of study and attainment of peak vision was 19 days. No distance vision was obtainable at the end of the study as the parents did not take the patient back to the doctor's office until six months after the last hypnosis session.

CASE 7

M. H., a boy, aged seven years. The parents stated that he had failed his school vision test last year and that he held school work excessively close. They gave a history of asthma and hay fever but no family history of squint or one-eyed visual deficit.

Prestudy vision tests. On January 21, 1956, when

TABLE 6

CASE 6: HYPNOSIS VISUAL ACUITY STUDIES OF AMBLYOPIC EYE

Session	Date	Prehypnosis	Posthypnosis
#1	5-15-57		
	AO #1996	14/112 = 20/160	14/42 3+ = 20/60
			14/35 3+ = 20/50
	Time = 30 min.		14/28 3+ = 20/40
			14/24.5 = 0
#2	5-17-57		
	AO #1996	14/28 = +	
		14/24.5 = 20/35	14/21 = 20/30 2 of 5 correct
	Time = 10 min.		
#3	6-3-57		
	AO #1996	14/28 = 20/40	14/17.5 = 20/25
	Time = 10 min.		
	11-29-57—No hypnosis used—doctor's office—6 months post last hypnosis		
	Distance VAOD (+2.00 +.75 × 100) = 20/100		

the patient was six years of age, vision was: O.D., plano, 20/25+; O.S., plano, 20/50+2. Cycloplegic refraction showed: O.D., with a +1.25D. sph., 20/25; O.S., with a +1.0D. sph. ⊃ +0.25D. cyl. ax. 180°, 20/50+. No prescription was given but constant occlusion of the right eye was ordered. On February 7th, with the patient constantly occluding the right eye, vision in the left eye without correction, was 20/40. By March 31, the patient constantly occluding the right eye, uncorrected vision of the left eye was 20/25. However, the patient had developed an acute blepharitis with meibomitis and secondary conjunctivitis of the right eye and occlusion had to be discontinued. By April 23rd, vision, O.S., was 20/30+2. On June 9th, vision in the left eye was 20/30, and occlusion of the right eye was renewed part time. By June 14th, vision was: O.D., 20/20—1; O.S., 20/25. Eleven months later, on May 2, 1957, with no occlusion for six months, precycloplegic vision was: O.D., 20/25+3; O.S., 20/50+2, not improved with pinhole; and cycloplegic refraction showed: O.D., with a +1.0D. sph. ⊃ +0.25D. cyl. ax. 90°, 20/20—; O.S., with a +1.25D. sph., 20/50+2. Near vision in the left eye on the AO #1984 chart with correction was 0.75 m. No lens was prescribed.

Ocular motility examination. Light reflexes were well centered in the primary position for near and far with no tropia. Maddox rod showed an exophoria of eight prism diopters for near and four prism diopters for distance. Normal symmetric movements were present in the cardinal fields and gross stereopsis on the American Optical stereofly test. There was fusion in the left eye on the Worth-four-dot flashlite test for near and distance. The near-point of convergence (remote) was 100 mm.

Ocular physical examination. External examination was normal, with clear corneas. Anterior chambers were deep and clear. Pupillary light reflexes were brisk. Lens was clear. Fundus visibility was 20/20, O.U. Disc normal, O.U., with a broad temporal nerve shelf four disc vessel diameters wide. The macula of the right eye showed a few paramacular colloid deposits. The paramacular retina of the left eye showed a few pinhead-sized, faint-yellow, sharply outlined drusen. Foveal light reflexes were absent, O.U.

Diagnosis. (1) Suppression amblyopia, O.S.; (2) isometropic hyperopia; (3) exophoria with no strabismus. The hypnosis study is given in Table 7.

This child's amblyopia had previously proved amenable to constant occlusion but the vision fell off with discontinuance of patching. The peak vision obtained with occlusion was re-established with hypnosis. The total physician-patient contact time required to obtain peak near vision of 20/20 was 30 minutes. The total time between the start of the study and peak near-vision attainment was also 30 minutes, since the maximum visual gain occurred in the first hypnosis session. The best distance vision attained (20/25) was one line short of the best near vision performance (20/20). Office examination showed a good posthypnotic improvement maintenance at 72 hours posthypnosis with a distance vision, O.S., of 20/25, but both the near and distance vision had regressed by several weeks posthypnosis. The near-vision quality was again improved with the third hypnosis session.

CASE 8

J. B., a boy, aged 13 years, was born at full term. The left eye was reported to turn in since birth. There was no family history of turned eye. Poor vision in the boy's left eye had been known for several years. Also recurrent redness of eyes and lids had been observed for several years. He had worn glasses since the age of eight years. His present glasses were one year old and did not provide good vision for the left eye.

Prestudy vision tests. On May 10, 1957, distance

TABLE 7

CASE 7: HYPNOSIS VISUAL ACUITY STUDIES OF AMBLYOPIC EYE

Session	Date	Prehypnosis	Posthypnosis
#1	5-22-57 AO #1996	14/24.5 = 20/35	14/14 = 20/20
#2	6-11-57 B&L H-452	14/17.5 = 20/25	20/20 4 of 5 correct
	6-14-57—No hypnosis used—doctor's office—72 hours posthypnosis Distance VAOS with no correction = 20/25		
	AO #1984	Near VAOS—0.62m line = all words read 0.50m line = most words correct with some errors	
	7-19-57—No hypnosis used—doctor's office—5 weeks posthypnosis Distance VAOS—20/30 − 2		
	7-31-57—No hypnosis used—doctor's office—7 weeks posthypnosis B&L H-452 B&L X-54 AO #1984	Near VAOS—20/40 − 3 VAOS—20/40 − 3 VAOS—1.00m paragraph only with errors (regression!)	
#3	9-24-57 Follow up (3 months) AO #1996	20/25 all letters correct	20/25 all letters correct
	9-30-57—No hypnosis used—doctor's office—6 days posthypnosis follow-up session Distance VAOS—20/30 − 2 B&L H-452	Near VAOS—20/40 − 3	

vision, O.D., with a −0.75D. sph. ⊃ +50D. cyl. ax. 15°, 20/20; O.S., with a −1.25D. sph. ⊃ +50D. cyl. ax. 160°, 20/50−1, not improved with pinhole. On May 15th, vision, O.S., with the same correction, was 20/50. On July 3rd, distance vision, O.S., with the same correction, 20/50. With the B & L H-452 chart, near vision, O.S., was 20/60; with the AO#1984 chart, it was the 1.0 m. paragraph.

Ocular motility examination. The Hirschberg test showed a left esotropia of approximately 10 degrees. There was no significant variation of esotropia in cardinal fields. The near-point of convergence was to the bridge of the nose. Prism cover test showed 18 prism diopters of esotropia for distance and 25 prism diopters esotropia for near with glasses. Without correction there was an esotropia of 16 prisms for distance and 25 prisms for near. The troposcope showed: ET of five prism diopters subjective, and an ET of 15 prism diopters objective. The patient had diplopia at the objective angle of squint.

Ocular physical examination. External examination showed three-plus seborrheic crusting with redness of lid margins and mild secondary lid and global conjunctival injection, O.U. Corneas were clear. Anterior chambers were deep and clear. Pupillary light reflexes were brisk. Lenses were clear, O.U. The fundus visibility was 20/20, O.U. The discs were normal, with temporal nerve shelves four disc vessel diameters broad, O.U. Disc margins were sharply defined. The maculas were normal, with positive foveal light reflexes, O.U. The vessels and peripheral fundi were normal.

Diagnosis. (1) Suppression amblyopia, O.S.; (2) low myopic astigmatism with slight anisometropia; (3) left esotropia. Hypnosis studies are shown in Table 8.

This patient showed a dramatic gain in near visual acuity in the first hypnosis session—20/120 to 20/40—2. A significant regression in near-vision performance occurred after the third session, and the regression decrement was not restorable in the fourth hypnosis session. The final distance vision performance, 20/30—1, was superior to the final near vision, 20/35. The physician-patient contact time required to attain peak near vision of 20/25—1 was one hour. The total time from the start of the study to peak near vision attainment was five days.

CASE 9

M. C. W., a girl, aged eight years, was born at full term, by breech delivery. No turning of eye was observed by the parents. The family history was negative both for squint and one-eyed vision deficiencies. The parents reported that the patient held her work too close to her eyes and that she failed the school vision test.

Prestudy vision test. On April 9, 1956, cycloplegic refraction showed: O.D., with a +1.25D. sph. ⊃ +0.25D. cyl. ax. 90°, 20/20; O.S., with a +5.0D. sph. ⊃ +2.0D. cyl. ax. 90°, 20/80. Prescribed: O.D., plano, 20/20; O.S., with a +4.0D.

TABLE 8

CASE 8: HYPNOSIS VISUAL ACUITY STUDIES OF AMBLYOPIC EYE

Session	Date	Prehypnosis	Posthypnosis
#1	7-10-57 AO #1996	14/84 = 20/120	14/28 = 20/40 3 of 5 correct
#2	7-12-57 AO #1996	14/30	14/17.5 = 20/25 3 of 5 correct
#3	7-15-57 AO #1996	20/25 3 of 5 correct Patient referred back to doctor	20/25 4 of 5 correct
	7-18-57—No hypnosis used—doctor's office Distance VAOS with correction = 20/30 − 1 B&L H-452 Near VAOS with correction = 20/60 (not improved with pushing) AO #1984 Near VAOS with correction = 1.25m line Patient shows marked signs of frustration on doctor pushing near-test effort. Reports "words are piled up in one little space"		
#4	7-25-57 AO #1996	20/35	20/35
	Definite regression from second visit which could not be altered under hypnosis today		

sph. ⊃ +2.0D. cyl. ax. 90°, 20/80. Full-time occlusion was started on April 12th. On April 26th, vision in the left eye with the same correction, occluding full time, was 20/60. On June 11th, occluding full time and with the same correction, vision in the left eye was 10/40—2. By July 12th, under the same conditions, it was 20/30—2 and on August 23rd, 20/25. On this date the patient was put on part-time occlusion. However, the patient did not consistently follow the part-time patching schedule, so by December 10th, with the same correction, vision had regressed to 20/30—1. On July 2, 1957, distance vision in the left eye, wearing the same correction, was 20/30. The patient had not been occluding. Near vision on the B & L H-452 chart and with the same correction, left eye, was 20/40—1; on the AO #1984 chart, with corection, 0.75 m.

Ocular motility examination. The corneal light reflexes were centered in the primary position far and near, and in the cardinal fields. No tropia was present and no ocular movement under cover. Near-point convergence was to bridge of nose. The troposcope showed Ex, 0. Subjective and objective angles were the same. Fusional convergence amplitude was 25 prism diopters. Fusional divergence amplitude was six prism diopters.

Ocular physical examination. External examination was negative; media clear; lens clear, O.U. Fundus visibility was 20/20, O.U. Discs were normal, maculas were normal, foveal light reflexes were positive, O.U. Peripheral fundi and retinal vessels were normal.

Diagnosis. (1) Suppression amblyopia, O.S.; (2) hyperopia with anisometropia; (3) no strabismus. The hypnosis findings are shown in Table 9.

This eight-year-old patient had previously shown a significant distance vision gain with full-time occlusion, with a moderate visual acuity decrement following discontinuance of patching. The maximum visual acuity of 20/25 gained in the amblyopic eye with occlusion was also obtained with hypnosis but was not retained. The near-vision gain considerably exceeded the far-vision gain because the starting near vision, 20/50, was of poorer quality than the initial far vision of 20/30. Patient-physician contact time required to reach peak near vision was 60 minutes. Total time from start of study to peak near vision attainment was five days.

DISCUSSION

This study was initiated to evaluate the functional aspects of suppression amblyopia with the use of hypnotic suggestion. The abrupt single session gains in near vision, made by eight of the nine children hypnotized, leave little doubt as to the presence of a functional component of visual suppression in eight of nine cases studied.

The controls provided by the nonhypnotizable suppression patients were not ideal in that these patients might be considered to be generally refractory to suggestion of any kind. The most reliable control evaluations for visual improvement were those made from the study of the group of hypnosis-improved patients. In each of these patients nonhypnotic persuasion techniques were used prior to hypnosis in an attempt to improve vision in the amblyopic eye. The single session improvement gains obtained by simple

TABLE 9

CASE 9: HYPNOSIS VISUAL ACUITY STUDIES OF AMBLYOPIC EYE

Session	Date	Prehypnosis	Posthypnosis
#1	7-10-57		
	AO #1996	20/50	20/30
#2	7-12-57		
	AO #1996	20/30	
		20/25 = 3 of 5 letters correct	20/25 = 3 of 5 letters correct
#3	7-15-57		
	AO #1996	20/25	20/25
	7-23-57—No hypnosis used—doctor's office—one week posthypnosis		
	Distance VAOS with correction = 20/25 − 2		
	B&L H-452	Near VAOS = 20/40 − 3	
	AO #1984	Near VAOS = 0.62m	
#4	7-29-57		
	AO #1996	20/30 all letters correct	20/25 3 of 5 letters correct
		20/25 = 0	
	B&L H-452	20/30 4 of 5 letters correct	20/20 3 of 5 letters correct
	AO #1984	0.62m	0.62m
	7-30-57—No hypnosis used—doctor's office—one day posthypnosis		
	Distance VAOS = 20/25 − 2		
	B&L H-452	Near VAOS = 20/40 + 1	
	8-30-57—No hypnosis used—doctor's office—one month posthypnosis		
	Distance VAOS = 20/30 + 2		
	B&L H-452	Near VAOS = 20/30 − 2	
	AO #1984	Near VAOS = 0.62m read one sentence only and stopped	

persuasion prior to hypnosis, in these more "suggestible" patients, were insignificant.

The manifest failure of the distance-vision improvement to match the near-vision gain in our pilot study of adult patients led us early to re-inventory our standards of near-vision testing in order to bring their reliability to a point at which testing errors could be excluded as a factor in near-vision gain. With this accomplished, we still found that in the child group the distance-vision gain did not, in general, approximate the near-vision improvement.

The tendency for regression of the near vision performance and the regression tendency shown by several of the hypnosis-improved patients, following the attainment of their peak vision, suggest that the problems of posthypnotic vision improvement maintenance do not differ essentially from those of occlusion-improved patients. The binocular discomfort factors which originally induced suppression are presumably still operating to re-establish the amblyopia. Therefore, corrective procedures such as squint surgery, size lenses, and orthoptic training are essential to the permanent obtainment of vision gain for the amblyopic eye.

Our limited, unreported observations of emotional lability factors found to be present in some patients of our small study groups led us to a conjecture: namely, that some suppression amblyopias possibly have a causal component of emotional disturbance co-existent with ocular stress factors with the chronic conversion of emotional maladjustment factors into the somatic expression of their amblyopia.

The six to 13-year-old group of hypnosis-improved patients is now receiving systematic study by child psychiatrists with the objective of a correlative evaluation of the relative roles played by emotional factors versus optical and oculomotor stress factors in their amblyopias. Further studies of larger patient groups are needed so that collective

TABLE 10

SUMMARY OF NEAR VISION TEST RESULTS—HYPNOSIS

Number, Patient, Age (yr.)	Best Single Session Vision Gain		Starting Vision	Peak Vision	Final Vision	Visual Acuity for Distance Start and End of Study	
	Pre-hypnosis	Post-hypnosis				*Start*	*End*
#1 L.D. 9	3-28-57—3rd session *20/60−3 †1.0m	*20/40+ †0.75m+	2-13-57 *20/80−2 †1.25m	7-24-57 *20/30	7-24-57 *20/30+ †0.62m (4-9-57)	20/50	20/30
#2 S.P. 11	8-5-57—5th session *20/35	*20/30	3-25-57 ‡20/60+1 †1.0m	8-5-57 *20/30 ‡20/40+2 †0.75m	8-5-57 *20/30 ‡20/40+2 †0.75m (9-7-57)	20/60	20/40 +2
#3 S.J.W. 5	4:10-57—1st session *20/40	*20/30	4:10-57 *20/40	4-17-57 *20/20	8- 7-57 *20/25 3+/5	20/50	20/50
#4 B.L.Mc. 7	4-23-57—1st session ‡20/60	‡20/40	4-23-57 ‡20/60	4-24-57 ‡20/30	4-27-57 *20/30	20/60	20/50
#5 A.H. 9	5-13-57—1st session *20/120 20/80=0	*20/60 3+/5	5-13-57 *20/120	5-15-57 *20/40−2	6-5-57 *20/35	20/160	20/70
#6 K.T. 7	5-15-57—1st session *20/160	*20/40 3+/5	5-15-57 *20/160	6-3-57 *20/25	6-3-57 *20/25	20/70	not obtainable
#7 M.H. 7	5-22-57—1st session *20/35	*20/20	5-22-57 *20/35	5-22-57 *20/20	9-24-57 *20/25	20/50	20/30 −2
#8 J.B. 13	7-10-57—1st session *20/120	*20/40 3+/5	7-10-57 *20/120	7-15-57 *20/25−1	7-25-57 *20/35	20/50	20/30 −1
#9 M.C.W. 8	7-10-57 *20/50	*20/30	7-10-57 *20/50	7-15-57 *20/25 7-29-57 ‡20/20−2	8-30-57 ‡20/30−2	20/30	20/30 −2

* Near test card #1996—American Optical—Illiterate "E"—reduced Snellen.
† Near test card #1984—American Optical—word card.
‡ Near test card H-452—Bausch & Lomb Optical—letter card—reduced Snellen.

data can afford us more information on this subject.

The physician should be both guarded and selective in the use of hypnosis. Reliable reports are available concerning patients whose anxieties and emotional disturbances have been seriously exacerbated by the inappropriate use of this aid.

Summary

1. In a patient group of 19 children with suppression amblyopia, nine children proved capable of hypnotic induction to a state of somnambulism.

2. Of the nine children hypnotized, all except one (case 3) were somewhat beyond the age of maximum amenability to occlusion therapy.

3. Following suggestion made during hypnosis that they would see well with the amblyopic eye, all nine children showed significant posthypnotic near-vision gains.

4. Eight of the nine children showed significant near-vision improvement in single sessions immediately following hypnosis. This "on the spot" vision improvement could not be attributed to any cause other than hypnotic suggestion. One child showed mainly an interval or "between session" type of vision improvement, which was not valued as a completely hypnosis induced gain.

5. In occasional distance vision tests made:

(a) Four children (1, 2, 7, and 8) showed distance-vision gains comparable to their near-vision improvement. In none of these, however, did the distance-vision gain quite equal the near-vision gain.

(b) Three patients (3, 4, and 9) showed little or no distance-vision gain.

(c) For one child (6), no final distance-vision report was available.

(d) In one child (5), distance vision improved from 20/160 to 20/70 but could not be improved further.

6. In control study sessions conducted to investigate the near-vision gain obtainable by "nonhypnotic" persuasion, only one of 10 nonhypnotizable children showed a single session vision improvement of one full test line. Of the nine children improved under hypnosis, none showed significant "on the spot" vision gains from nonhypnotic persuasion used prior to starting hypnosis.

Conclusion

Nine of 19 child patients with suppression amblyopia were hypnotizable to a somnambulistic state. Suggestion was made under hypnosis that they would see well posthypnosis with the amblyopic eye.

Eight of the nine children showed significant gains in visual acuity immediately after hypnosis, which could be reliably attributed to hypnotic effect. In general, the improvement obtained in distance visual acuity of the amblyopic eye was less than the near-vision gain.

5323 Harry Hines Boulevard (19).

EMERGENCY PENETRATING KERATOPLASTY

In the treatment of perforated corneal ulcers

Daniel M. Taylor, M.D.
New Britain, Connecticut

With the advent of chemotherapy and antibiotics the incidence of serious corneal ulceration with progression to perforation is decreasing. This is indeed fortunate for many of these perforated eyes were lost outright by progression of the infection to the inner contents, resulting in endophthalmitis, panophthalmitis, and eventually phthisis bulbi or total loss from surgical removal. In those cases which healed frequently the eye was so badly damaged that useful vision was lost. Dense corneal scarring, adherent leukoma, peripheral synechias, intractable secondary glaucoma, and anterior staphyloma often proved to be the pathologic chain of events.

Although fulminating bacterial ulcers are being prevented or brought under control with antibiotics, the ophthalmologist is frequently faced with the challenging problem of the treatment-resistant herpetic corneal infections and possibly other viral keratidi-

tes. At this time it is debatable as to whether or not the frequent use of steroids is instrumental in producing either a real or apparent increase in the incidence of chronic progressive herpes. In any event we are now very much aware that many of these herpetic infections may run a chronic course and progress from a superficial dendritic keratitis to a disciform keratitis and even to necrosis of the corneal stroma, with sloughing, perforation, and eventual loss of the eye.

The fact that severe corneal ulceration which progresses to perforation frequently results in loss of the eye or structural damage inconsistent with useful vision suggests that the time-honored conservative methods of treatment should be critically reviewed and re-evaluated.

It has been my belief for several years that, in certain relatively clean corneal ulcers which go on to perforation, there is a lag phase before endophthalmitis and panophthalmitis or irreversible anterior and posterior synechias develop, during which time an emergency penetrating transplant might effectively restore the continuity of the structurally deficient eye. When herpetic ulceration is the cause of perforation, I would, in addition, hope that extensive grafting would prevent further relapses by removing all of the corneal tissue containing herpes-simplex virus. These thoughts were considered some four years ago after a third disastrous experience in dealing with this type of case.

Case report

In August, 1953, a young woman presented herself with a central corneal ulcer of unknown etiology that had steadily and relentlessly progressed to a large descemetocele despite antibiotic therapy by another physician. Cultures taken at this time were later reported as negative. After applying a pressure patch, she was immediately hospitalized. However, examination the next morning revealed that the cornea had perforated, leaving a large punched-out central defect of at least four or five mm. in diameter plugged by lens and iris. The surrounding cornea appeared remarkably clear and there was no clinical evidence of intraocular infection.

Because of overwhelming obstacles consisting of lack of good instruments, donor material, and the environmental situation the possibility of performing an emergency therapeutic graft was dismissed. I likewise believed that a conjunctival flap pulled over the area would be of little value because of the size of the corneal defect.

Treatment was therefore conservative and consisted of atropine, antibiotics, bedrest, and sedation. During the next 24 hours, the patient must have inadvertently squeezed for, upon removal of the dressings, the lens and vitreous were found to be extruding through the corneal defect. Enucleation was therefore mandatory.

Fig. 1 (Taylor). This photograph was taken three weeks after corneal transplantation as an emergency treatment for a perforated eyeball.

This eye was lost not because of infection or other frequently given reasons but simply because the eye could not tolerate the structural defect in the anterior segment. Unless this defect was replaced with corneal tissue the outcome was inevitable. I firmly believe that the loss of the eye might have been avoided if I had performed a penetrating keratoplasty. Because of the unfortunate and regrettable outcome I resolved to attempt a penetrating graft on any future case with similar findings.

Four years later two patients with perforated corneal ulcers came under my care. The first case was unfortunately hopeless, as panophthalmitis was present and therefore evisceration or enucleation was the only course of action remaining. It did, however, serve to reawaken a dormant interest in this type of problem so that I was psychologically primed to deal with the second case that appeared one week later.

Case report

In August, 1957, a young man, aged 34 years, presented himself for the first time with a perforated corneal ulcer of the left eye due to herpes simplex which had been chronic over a four-year period and had progressed to disciform keratitis, lamellar necrosis, and finally perforation two days before his visit. He had been treated by cauterization and every conceivable type of medication, including the much condemned steroids, over the four-year period.

There was a large central grayish, opaque, partially necrotic area of disciform degeneration about five to six mm. in diameter, with a central perforation two mm. in diameter. The anterior chamber was collapsed and the defect was plugged with iris and lens. Vision was reduced to light perception only. Clinically, the eye seemed to be relatively clean and there was no evidence of secondary intraocular infection. There was a layer of fibrin over the exposed iris and lens.

This seemed to be the ideal case in which to attempt an emergency therapeutic corneal transplant. A rapid review of the available literature revealed that a successful keratoplasty had been performed on a perforated eyeball by Dr. Paton and he had reported this in his book on keratoplasty. Fortified with this information I proceeded.

The previously encountered obstacles of lack of instruments and a donor eye required some maneuvering. A corneal grafting operation had never been performed at our hospital and therefore the necessary instruments were not available. In addition, the administrative staff was not certain of the necessary legal protocol in obtaining an eye should one become available at our hospital. A check throughout the state revealed that no hospital possessed grafting instruments or an available eye. A call to the resident on duty at the Eye-Bank in New York also resulted in temporary frustration as no suitable eye was immediately available.

On the following day an eye was obtained from a patient who had died at our own hospital in the early morning hours. An ophthalmologist from a city 30 miles away had heard of our search for grafting instruments and volunteered the use of his personal set.

Although a lamellar or mushroom type of graft might have been the procedure of choice, I elected to do a penetrating graft because a seven-mm. trephine completely covered the necrotic area, leaving clear recipient cornea on all sides.

Since it is almost impossible to trephine a perforated globe, the technical difficulty of removing the recipient cornea was overcome by following Paton's suggestion that the area on the recipient eye be marked out with the trephine and stained with fluorescein. The scissors are then inserted through the perforation and cutting is along the outlined area. This technique resulted in a somewhat ragged recipient bed but, after using 10 direct 6-0 black-silk sutures, the donor graft seemed to fit watertight in its bed.

A culture taken from the anterior chamber at the time of surgery was reported as negative.

It is interesting to note that it was possible to tease away the fibrin covering the iris and anterior lens capsule without producing a traumatic cataract. The fibrin was filmy, loosely adherent, and stripped away with a minimum of manipulation and irrigation. This might not have been possible had operation been postponed another day or so.

On the fourth postoperative day, the chamber reformed. The patient had an uneventful postoperative course, with the exception of an anterior synechia at the nasal aspect of the graft margin.

It is now two months since surgery. The graft remains clear, there is no secondary glaucoma or iritis, the eye is white and asymptomatic, and the patient has recovered vision to 20/40 with a corrective lens. The anterior synechia has not been lysed to date and, in the absence of clouding of the graft or other complications, I am satisfied to pursue a course of watchful waiting, hoping that the eye has been saved, useful vision restored, and all traces of the herpes virus eliminated so that he will be free from further attacks of herpes keratitis.

Discussion

If conservative treatment had been followed either with or without a conjunctival flap to cover the defect, I believe from the clinical appearance that the eye would have been lost either from secondary infection or irreversible structural changes during the healing process.

In the recent excellent symposium on virus keratitis, Dr. Hogan reports two successfully grafted cases of severe herpetic keratitis that had gone on to perforation. To my knowledge these cases together with Dr. Paton's and mine, totaling four, are the only ones that have been reported in the American literature.

Summary and Conclusions

1. The conservative management of perforated globes secondary to corneal ulceration should be carefully re-evaluated, as the end-result often leaves much to be desired. As an alternative, in selected cases in which the ulcerated perforated area appears relatively clean and before panophthalmitis and other irreversible structural changes have occurred, a penetrating transplant may restore the continuity of the eye and even result in useful vision. The excellent results obtained here and in the two cases reported

by Dr. Hogan and the one reported by Dr. Paton suggest that emergency keratoplasty may offer considerably more than conservative management.

2. A heroic attempt should be made to restore these damaged eyes either by a lamellar type of graft to seal the defect or a penetrating graft if the entire area can be removed. This treatment seems particularly indicated when the ulceration is herpetic in type. By this means, the herpes virus may be eliminated and further attacks of keratitis may thus be prevented.

3. Obstacles, such as lack of instruments and donor material should not be deterring factors, as this case illustrates. For the benefit of those men practicing in smaller communities I would like to point out again that this emergency procedure was done in a moderate-sized general hospital where a corneal transplantation had never been done before. This made the procurement of instruments for the emergency most difficult but it was accomplished. In addition, since it was necessary to circumvent the usual eye-bank channels, the local house and administrative staffs had to rise to the occasion. This they did and it was possible to obtain a donor eye from our own hospital.

32 Grove Hill.

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Ophthalmic Miniature

"When I had given up inquiring into real evidence," he (Socrates) proceeded," I thought that I must take care that I did not suffer as people do who look at the sun during the eclipse. For they are apt to lose their eyesight, unless they look at the sun's reflection in water or some such medium. That danger occurred to me. I was afraid that my soul might be completely blinded if I looked at things with my eyes, and tried to grasp them with my senses."

Plato, *Phaedo.*

NOTES, CASES, INSTRUMENTS

AN IMPROVEMENT ON THE AFTER-IMAGE TEST*

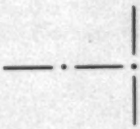
ROBERT R. TROTTER, M.D.
AND
ANN E. STROMBERG
Boston, Massachusetts

The after-image test is used to demonstrate the presence or absence of normal retinal correspondence.[1, 2] An estimate of the state of retinal correspondence is helpful in the evaluation of strabismus, especially in patients under the age of six years.

The standard after-image test is performed as follows:

The nondominant eye is covered, while the dominant eye fixes for 30 to 60 seconds on a mark at the center of a horizontal streak of light provided either by a showcase bulb or an appropriate slide in an amblyoscope. The dominant eye is then covered while the nondominant eye fixes for a like period on a mark at the center of a vertical streak of light provided by rotating the showcase bulb 90 degrees, or by a second slide in the amblyoscope. If normal retinal correspondence is present, a cross

will be seen with eyes open or closed, but if abnormal retinal correspondence is present, the patient will see a distorted cross, for example



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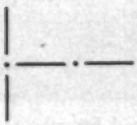

or

and so forth.

The method described above is often unsatisfactory in children under the age of six years because of inability of young (and some older) children to fix unwaveringly for the required period, and because of difficulty in making the child understand what is wanted.

The instantaneous flash of an electronic photographic flash unit has been used in after-image testing by Wahlgren and Swan[3] who, by covering the photographic reflector with a slotted mask, obtain a linear light source. Their apparatus has considerable merit, but these authors do not report a comparison of results achieved with their device and that of the standard method (showcase bulb and so forth).

AN IMPROVED METHOD

We have preferred to avoid the pattern of a helix or other configuration in the usual electronic flash tube, and have therefore used a linear flash tube which not only provides a more uniformly bright stimulus, but also a stimulus several inches longer than that of the device with slotted mask. It is the purpose of this paper to describe our apparatus, and to present data comparing the results it produces with the results produced by the standard after-image test for retinal correspondence.

1. EQUIPMENT

The light source employed in our improved after-image test is a straight glass tube 15 inches in length, with an inside diameter of one-eight inch and an outside diameter of one-fourth inch (both diameters approximate and neither critical). The xenon-filled tube is caused to flash for less

* From the Massachusetts Eye and Ear Infirmary. Presented before the New England Ophthalmological Society on February 20, 1957.

Fig. 1 (Trotter and Stromberg). Electronic flash after-image tester. The power supply is in the box at the bottom; the centrally pivoted flash tube is seen above, positioned vertically in the left-hand view, horizontally in the view at the right (separate photographs of the same device).

than 1/1,000 second by discharging through it 2,000 or more volts supplied from condensers charged by a circuit commonly used in electronic flash photographic equipment. The flash tube (figs. 1 and 2) is mounted on an arm which can be rotated manually through 90 degrees. The leads are enclosed in such a way that patient and operator are safe from electric shock.

Fig. 2 (Trotter and Stromberg). Electronic flash after-image tester. Examiner rotating the flash tube while condensers are recharging; push-button switch shown in examiner's left hand.

2. Method

The patient stands or sits at a convenient distance (about one meter) from the flash tube. Satisfactory fixation is obtained by inviting the patient to look carefully at a target at the center of the flash tube while the examiner observes the direction of gaze. With fellow eye covered, the dominant eye is exposed instantaneously by flashing the tube in a horizontal position; the tube is then rotated to the vertical position and the non-dominant eye (fellow eye covered) is similarly exposed. The patient is now asked to look at a blank wall (light gray or cream, flat paint, in our clinic) and to blink rapidly; then to draw what he sees, using chalk and slate, or paper and pencil.

Fig. 3 (Trotter and Stromberg). Hand-held electronic flash after-image tester.

TABLE 1

GROUP 1: COMPARISON OF RESULTS OBTAINED WITH OLD AND IMPROVED AFTER-IMAGE TESTS IN 119 CONSECUTIVE PATIENTS

Age (inclusive) (yr.)	Old Successful New Unsuccessful	Both Unsuccessful	Both Successful	Old Unsuccessful New Successful
3 to 7	1	12	20	31
8 to 12			27	19
13 to 19			5	4
	1	12	52	54

A test is considered successful if the patient is able to draw both a horizontal line and a vertical line, each with a break in the center corresponding to the area where the fixation target covers the flash tube, and if the lines are drawn in a relationship possible for the after-image to produce. Some young children (and, occasionally, older ones) are unable or unwilling to draw spontaneously a likeness of the after-image. In such a situation, the examiner sometimes must make several drawings, at the same time asking the child, "Does yours look like this—or this—or this?" When the child unhesitatingly chooses one of the examiner's drawings as picturing what he has seen, the test is considered successful.

An unsuccessful test is one in which the uncoached patient cannot produce (or choose) a drawing indicating that he recognizes an after-image.

RESULTS

Two groups of patients were given the after-image test in the Ocular Motility Clinic at the Massachusetts Eye and Ear Infirmary. In Group 1, the subject was first exposed to after-image slides in a major amblyoscope. Then, after he had given a response or failed to do so, he was exposed to the electronic flash tube, and a response was again solicited. Several minutes intervened between the two tests. Table 1 shows the results of 119 consecutive patients who were examined in this fashion.

In Group 1, it is evident that the old test was successful in 53 of 119 (44.5 percent) cases, while the improved test was successful in 106 of 119 (89.1 percent). Conversely, the old test was unsuccessful in 66 of 119 (55.5 percent) cases, while the improved test was unsuccessful in only 13 of 119 (10.9 percent). Eight out of the 12 tests considered unsuccessful by both old and improved methods were carried out on patients five years of age or under.

Because the patients in Group 1 might have received from exposure to the old test clues which influenced the response with the improved after-image test, a second series of 56 consecutive patients was tested by the improved method alone. The test was considered successful or unsuccessful by the same criteria employed for Group 1. Results with the second group were as shown in Table 2.

In Group 2 it will be seen that 52 of 56 (93 percent) of the tests were successful, and only four of 56 (seven percent) unsuccessful. Three of the four unsuccessful responses were given by children four years of age and under.

TABLE 2

GROUP 2: IMPROVED AFTER-IMAGE TEST ALONE, IN 56 CONSECUTIVE PATIENTS

Age (inclusive) (yr.)	Successful Tests	Unsuccessful Tests
3 to 7	32	3
8 to 12	18	1
13 to 19	1	
Unknown	1	
	52	4

Conclusions

Our improvement on the after-image test, making use of a linear electronic flash tube as a light source, elicits useful responses approximately twice as often as does the old test, which makes use of an elongated incandescent filament or slides in a major amblyoscope. In spite of its short duration, the electronic flash provides such great light intensity that the after-image it produces may persist for 20 to 30 minutes. The after-image produced by the electronic flash is so vivid that there is little difficulty experienced by the examiner in making the subject understand what is expected of him.

Because only momentary fixation is needed with the electronic flash method, many children (some as young as three years) who cannot be tested by the old technique respond satisfactorily with the improved method; with the old method successful results are unusual under the age of six years.

Because the improved after-image is so persistent that it may prove distracting to the patient, all other orthoptic diagnostic procedures should be carried out before exposing the patient to the electronic flash.

No injury to the eye, external or internal, is produced by exposure to the flash-tube employed in the improved after-image tester. It is not necessary to have the patient dark adapted in order to elicit an after-image by the improved method.

243 Charles Street (14).

Footnote

A light-weight, compact, hand-held instrument (fig. 3) is available from the Penn-East Engineering Corporation, South Willow Street, Kutztown, Pennsylvania. Trial of a prototype in our Ocular Motility Clinic has given very satisfactory results.

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RETINAL TEARS ASSOCIATED WITH TUMORS

Edward O. Bierman, M.D.
Santa Monica, California

In Volume III of his textbook, Duke-Elder says, "Once the diagnosis of retinal detachment is established, the essential point is the decision as to whether the detachment is simple or complicated by a tumor. It is sometimes not an easy matter to establish this with certainty, and since on the differential diagnosis depend decisions of the highest importance, the distinguishing points merit the closest attention." And, he continues, "The statement that the presence of retinal holes excludes a neoplasm (Lister, 1924) has never been contradicted."

The case to be reported and one now in the literature contradict this statement; even the presence of a tear does not definitely rule out a tumor.

Case reports

Case 1

History. M. N., an 80-year-old white woman, complained of gradual blindness of the left eye. She had been told by one doctor that she had glaucoma. Later she was told by another doctor that she had developed a tumor in the left eye. Surgery was not advised because of her age.

Examination. Visual acuity was: R.E., 20/20, uncorrected; L.E., no light perception. The chamber was somewhat shallow in both eyes but no more than would be expected at this age. The conjunctiva was slightly pale. Ophthalmoscopic examination showed the vessels of the right eye to be displaced nasally at the disc; a moderate amount of cupping was present. Grade 2 arteriosclerosis was present. The left eye had a giant tear temporally and inferiorly, associated with small hemorrhages. A large retinal detachment was present. Not

solid in appearance, it was too far posterior to be adequately transilluminated. The disc could not be seen because of the retinal elevation. Tension was normal but the patient was on pilocarpine (two percent) in both eyes.

Three months after her first visit the patient developed an acute glaucoma in the left eye. The eye had to be enucleated when all else failed to relieve the pain. The enucleated eye was sent to Doheny Eye Laboratory where a diagnosis of malignant melanoma of the choroid was made. The retina was elevated by fluid which had disguised the tumor.

Case 2

Kirk and Petty of the Illinois Eye and Ear Infirmary reported one case of serous detachment with retinal tear in malignant melanoma of the choroid. This one case was found in a series of 74 cases.

Discussion

I have seen one case in which a tumor was probably mistaken for a detachment with tear. Detachment surgery was successful for a short period of time, when a solid detachment occurred. By that time other secondary lesions of hypernephroma had been found. The case could not be considered definitely one of tumor, because the eye was not obtained for study. However, from all clinical appearances it was later typically tumor, and the history suggests the diagnosis.

Retinal tears are thought to be due to two factors, the amount of pull exerted by the vitreous and the resistance of the retinal elements to separation. Both factors are present in most patients suffering from retinal tears. Other factors should also be considered.

The pushing up of a tumor also exerts a force on a diseased retina. In the case herein reported, the patient's age indicates that retinal weakness probably was a factor in the tear. Either a push or a pull may tear the retina, if either exerts adequate force.

Other forces may cause tears, forces within the retina itself. The frequency of showers of vitreous floaters simultaneous with retinal tearing and detachment probably represents a retinal hemorrhage forcing its way through the retina into the vitreous.

The shock waves of trauma, the swelling of an inflammatory reaction, the traction of scar tissue both in the retina and the vitreous may result in tears. In fact, any force might cause a separation if properly applied. Retinal tearing does not, however, mean that the retina will detach. Tears are seen with no detachment. Sometimes retinal tears cannot be found in detachment even after a most thorough search. The causal relationship is not present. Tears do not necessarily cause detachments.

Retinal separation probably represents a far more complex mechanism than is commonly believed. I suggest that a biochemical reaction, possibly similar to any contact type allergenic reaction, might be the final cause of detachment in many cases. The subretinal fluid could be due to an attempt of the body to resist the irritation of the vitreous as it presents itself through the tear into a foreign area. In the absence of a tear, any foreign protein could provoke a retinal separation. The efforts of nature to block further separation seem to point to this. It may also be that, in some cases, the tear is a result of such biochemical reactions. Just as the malignant tumor caused a secondary tear, so also could any swelling. Consideration of this possibility would be justified.

Summary

Retinal tear can occur with tumor. It is suggested that routine chest X-ray films be included in the preliminary study of detachment patients in order to rule out secondary lesions of the area, as well as to aid in evaluation of the patient as a surgical risk.

A discussion of the relationship between retinal tumors, retinal tears, and retinal detachments is presented. The present concepts of retinal detachment do not apply in some cases.

1137 Second Street.

EPISCLERAL NEEDLES*

For foreign body localization

J. G. F. Worst, M.D.
Groningen, Holland

This present method of foreign body localization is one among a multitude of techniques which Duke-Elder has grouped as direct methods (Textbook of Ophthalmology, v. 6, p. 6,245). This type of localization has the advantage over other methods in that it also offers a direct surgical approach to the foreign body. It is curious to note how little help is gained from even the most accurate geometric calculations when one is confronted with the problem of where to incise. Even some of the direct methods are ineffective because there is no mark to follow during the operation.

The radiographs (figs. 1, 2, and 3) illustrate the method, the essential feature of which is the needles, curved to fit the scleral radius. The needles carry a hook to fit round a limbal ring. The needles are inserted at the limbus and are made to slide over the sclera.

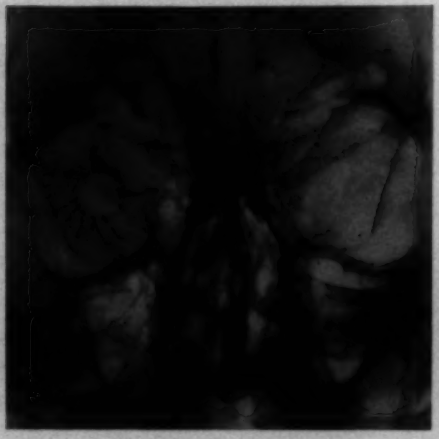

Fig. 1 (Worst). Frontal view of scleral needles with limbal ring. Reference to the side view (fig. 2) will prove that there is still X-ray parallax.

Fig. 2 (Worst). Side view. The foreign body is lodged in the ciliary body.

They are introduced slightly off the vertical and horizontal meridians to miss the rectus tendons. A limbal ring is clipped to the hooks by means of a special forceps with

Fig. 3 (Worst). The patient looks in the direction which gives the least parallax to the foreign body. Incision is six mm. from the ring and 1.5 mm. to the left of the lower needle. The foreign body was found at the bottom of the incision.

* From the University Eye Clinic. The scleral needles are manufactured by K. Otter, Medische Instrumentmarkerij, van Imhoffstraat 3, Groningen, Holland, for whose ingenious help I am grateful.

one double-toothed limb. The metal basket† is now in place. One scleral needle is inserted in the direction of the site of the foreign body as indicated by preliminary photographs. Measurements are taken from the "basket-radiograph," with a small correction for enlargement. The sclera is incised using the scleral needles as points of reference.

Since foreign bodies can be most easily localized if they are close to the sclera, it might be advisable to bring the foreign body to the sclera with the giant magnet traction, after which its exact site may be determined.

V. Starkenborghstraat 10.

† Mr. Paul Hamblin of London, coined the words "scleral spider" for it.

LID ABSCESS (GHANGAN)*

As a cause of cicatricial ectropion and lagophthalmos

Satnam Singh, M.S., and
A. D. Grover, M.S.
Aligarh, India

During 1956-1957, we visited 45 villages in the district of Aligarh to carry out the many activities of the Trachoma Pilot Project.† It was observed that large disfiguring scars on and around the eyelids were rather common in these villages and we decided to find out more details about them.

Clinical features

"Ghangan" is the local name given to a type of subacute pyogenic abscess. Children, between one to three years of age and belonging to the poorer section of the village, are commonly afflicted in the summer months. Though usually solitary, it is not uncommon for two or three abscesses to follow one after another (figs. 1, 2, and 3).

Fig. 1 (Singh and Grover). Typical irregular linear scars on the eyelids of a young woman.

Fig. 2 (Singh and Grover). Two unsightly scars following abscesses in childhood.

Fig. 3 (Singh and Grover). A small, recently erupted "ghangan" in a child, aged three years.

The site of predilection is the head and neck region; rarely the region of the sternum is involved. The abscess shows little or no signs of redness or heat. It simulates a loose bag of pus stuck to a base which is indurated. The general symptoms of fever and malaise are absent. Local prejudices are such that this abscess is never treated and is allowed to take its natural course, that is, it

* From the Gandhi Eye Hospital and the Institute of Ophthalmology.

† A two-year project started in October, 1956, by the Government of India with the technical assistance of the World Health Organization.

Fig. 4 (Singh and Grover). Cicatricial ectropion and lagophthalmos in a young adult. An opacity covers the lower one third of the cornea.

Fig. 5 (Singh and Grover). "Ghangan" scar, causing a mild degree of lagophthalmos in a girl, aged eight years. There is another scar in the adjoining temple region.

sloughs out the skin and later heals, leaving behind a large unsightly scar with tags of skin bridging across it or hanging from the margins (fig. 4).

It is usual for a child to suffer for six to 10 weeks. In a few cases, a granulating ulcer is later formed and this persists for many months. Rarely, in children exposed to exceptionally poor hygienic conditions, the healed scars breakdown almost every summer until the victim reaches the age of about 10 years.

Incidence

In each of the five villages selected at random covering a total population of 2,200 the "ghangan" scars were observed in five to seven percent of the village inhabitants. Care was taken to exclude scars consequent to trauma and cervical adenitis.

Features of ophthalmic interest

Typically, the horizontal disfiguring scars cover the lateral thirds of both the upper eyelids (fig. 1). In severe cases, because of destruction of tissue followed by cicatricial contraction, lagophthalmos results (fig. 5). When a similar lesion involves the lower lid, cicatricial ectropion follows (fig. 4).

The resulting exposure of the globe in individuals living in poor hygienic conditions invites repeated attacks of bacterial infection, resulting ultimately in severe corneal complications and blindness. Fortunately, most of the cases we observed showed only mild or moderate degrees of globe exposure.

Discussion

Due to the prevailing notions against treatment, it has not been possible to culture the pus and establish the etiologic diagnosis. In one case, where the abscess burst while cleaning its surface a pus smear was made. Gram staining showed numerous gram-positive cocci, mostly in long chains. In a second similar case, culture revealed Strep. hemolyticus.

Although "Ghangan" occurs mostly during the summer months, it has to be differentiated from the more common furuncles which occur during the rainy season and which are multiple and smaller in size and are accompanied by marked inflammatory signs. Caseating tubercular glands also are not infrequent, but they can be easily differentiated from true "Ghangan."

Institute of Ophthalmology.

USES OF A MONOCULAR CONTACT LENS

Richard A. Westsmith, M.D.
San Mateo, California

The use of a monocular contact lens may help solve some optical problems which otherwise are handled with difficulty or incompletely. The new microcorneal lens, with its greater tolerance, ease of fitting and insertion, freedom from need for use of fluids, and prolonged absence of clouding, has been accepted as a great improvement over the

older scleral lens. A statistical survey of patients' acceptance of this lens is being prepared and will be presented later.

In 1949 Berens[1] recommended that patients should be encouraged to try contact lenses only for pathologic and occupational reasons. At that time a limited time of tolerance was noted. Early veiling of vision was a predominant symptom. There was a high percentage of failures and the cost of the lens was excessive.

Many of these restrictions no longer seem applicable. Still, suitable cases only must be accepted. There must be a real visual need and the patient must desire to wear contact lenses. He must also realize that in most cases they supplement regular spectacles.

I say in most cases, because I have one patient with precorneal lenses, who has worn them for a little over a year and who now takes them out only for cleansing purposes once or twice a week. She leaves them in all night and has had absolutely no difficulty. I have tried to discourage this practice but she is adamant.

Children under the age of 16 years are usually not good patients, although Levitt has reported the use of a contact lens in a child aged seven years with monocular aphakia.[2] Old persons are excellent patients if they have a steady hand.[3]

Corneal lenses are said to be less suitable for cases of high astigmatism or marked keratoconus[4] although I have recently seen a girl with an 8.0D. cyl. whose vision is 20/20 with a precorneal lens.

There are some contraindications to the use of corneal lenses. I feel it is undesirable to use them following an injury to the cornea which results in recurrent erosion, in cases of nevus near the limbus or of pterygium. Some corneas show evidence of irritation which does not improve while the patient is striving to tolerate contact lenses. Continued staining should be a warning to discontinue wearing the lens. In the presence of glaucoma, there is evidence that scleral contact lenses should not be used.[5] I find no report of such a study with corneal lenses.

Monocular contact lenses have been successfully used in unilateral aphakia, natural anisometropia, unilateral astigmatism, corneal opacities, monocular telescopic appliances, presbyopia, in subnormal vision, for contact occluders, in albinism with nystagmus, in neuroparalytic keratitis, in irregular astigmatism, and after corneal abrasion to the opposite eye.

Monocular aphakia

In monocular aphakia, the use of a single contact lens has been most rewarding, in spite of Cowan's pessimistic evaluation of the optical inadequacies.[6–11]

It has been very discouraging that a unilateral aphakic should be denied binocular vision. I have a score of patients capable of binocular comfort with a corneal lens correction. The decision of when to remove a senile cataract much more advanced in one eye is also made easier. There has been an honest disagreement as to management of unilateral senile cataract. Some have argued that a lens should be removed when it reduces vision sufficiently, regardless of nearly normal vision in the other eye. This policy obviously avoided the complications of hypermaturity, invisible intraocular pathology, and convergence weakness. Others felt there was little to gain by such surgery until the lens matured. The patient frequently failed to understand the need for surgical removal of a lens with such little reward to vision, no matter how often the explanation was given before surgery. With a corneal lens and binocular vision available, benefits from early surgery are enormous, immediate, and evident.

The postoperative cornea has a high degree of tolerance for contact lenses.[12] Such patients are delighted with the freedom from a heavy cataract lens with its distortion of images. I have also been agreeably impressed with the increased focusing power with the corneal lens. The reading add frequently need be no more than a plus 1.5D.[13] Moione suggests this is due to decentration of the corneal lens associated with converg-

ence. Some patients show a correction of an exotropia of the aphakic eye with a corneal lens in place.[7,14]

Natural anisometropia

In natural anisometropia, unassociated with aphakia, the use of a monocular contact lens has been particularly satisfying.[15] Patients with such a refractive inequality are frequently intolerant of a full regular spectacle correction of the eye with the higher error, particularly in presbyopia. I have recently given a corneal lens with a −3.5D. sph. ⊃ +1.0D. cyl. ax. 90° in the left eye. Plano at distance with bifocals gives this 45-year-old woman perfect binocular vision at far and near. For the first time she has been able to tolerate a correcting lens on the left eye. A 41-year-old salesman, with a +4.0D. error in his right eye and a +0.25D. in his left is comfortable with a corneal lens on the right eye, and no correction on the left.

Corneal opacities

The use of a corneal lens on a corneal opacity has been reported by Freeman.[16] The lens frequently need have no strength of correction; merely the wearing of a corneal lens prevents the distortion and dazzling effect of the opacity in the cornea, with marked improvement in vision.

Presbyopia

The use of a contact lens in presbyopia as a substitute for bifocals is a solution to which I find no reference in the literature. Recently I had a corneal contact lens of +1.5D. ground for my left eye as my right is my dominant eye. My vision is 20/20 at distance in each eye, although slightly hyperopic, and I wear a +1.5D. reading add. Bifocals are particularly troublesome to me in ordinary office routine because I am not accustomed to wear them while using an ophthalmoscope, retinoscope, or slitlamp; so it means constantly taking the glasses off and on in the office. I have had the contact lens about a month now and I find that I am able to wear it comfortably all day and I have complete clarity of near vision. I am undisturbed by the slight blur in my left eye at distance. With the corneal lens in place, my vision in the left eye is 20/50. However, with both eyes I am able to read the 20/20 line comfortably and Jl at 18 inches. There is no trouble with the ophthalmoscope, retinoscope, or slitlamp.

I have given this arrangement to a 52-year-old myopic (−2.0D.), correcting one eye for distance and letting him use his unaided eye at near for reading. He is slightly disturbed at distance but is improving in this regard each week. Four other presbyopic patients have been given prescriptions for monocular lenses, but there has not been time to evaluate their tolerance.

Subnormal vision

In cases of subnormal vision, the use of a single corneal lens may be very helpful. I have an albino patient with an alternating esotropia, nystagmus, and aphakia, whose vision is considerably aided by a single corneal lens over her better eye. This lens is ground with a pigmented iris and a pupil placed between two layers of corneal lenses. While this tends to make the lens a little thicker, she has no difficulty with the motion of the lid over it. I am attempting to give her a similar lens for the right eye, so that she will be able to use the newly operated aphakic eye for distance and the other for near. Anderson reports considerable improvement in subnormal vision with the use of a contact lens.[17]

Other uses

The use of a single corneal lens in conjunction with a telescopic attachment has been reported.[18] Work is at present in progress to modify such an arrangement for operating telescopic lenses.

Since the beginning of this study on the use of single corneal lenses, I have had approximately 10 patients who have been able

to wear one corneal lens satisfactorily and comfortably on one eye during a period of irritation in the opposite eye. One patient developed a corneal abrasion from a foreign body in the right eye and was unable to tolerate her corneal lens after healing. She is perfectly comfortable wearing the contact lens on her uninjured eye in spite of an induced anisometropia of −3.5D. A second myope of −5.0D. had a history of recurrent erosion following a fingernail abrasion of the right eye and she has been able to go without the corneal lens in her injured eye during the period of disability.

The report of a contact lens being used for protection of an eye suffering from neuroparalytic keratitis seems contradictory in principle.[19]

Summary

In summary, a monocular contact lens may offer great help when one eye is optically quite different from the other, or when bifocals are a great impedance.

12 North El Camino Real.

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OPTIC NEURITIS

Associated with Bornholm disease

Don C. Turnbull, M.D.
Birmingham, Alabama

It is the purpose of this paper to (1) report a classic case of optic neuritis in an 11-year old boy, (2) cite its rapid response to steroid therapy, and (3) introduce to the literature another possible etiologic source of optic neuritis.

Case report

W. C., an 11-year-old white boy, first came to the office on July 19, 1957, with complaints that the vision in the right eye had been blurred for a week or so, and that up or down movement of the eye caused discomfort. Uncorrected vision was: R.E., 20/200—; L.E., 20/20. There was a slight exophoria at near, orthophoria at far, and the near-point of convergence was on the nose.

External examination was negative except that the right pupil reacted promptly to light by constricting but the constriction was only short-lived, the pupil dilating while still under the influence of the bright light. The left pupil reacted normally.

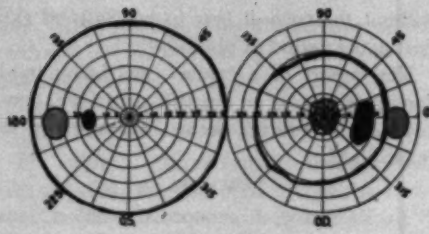

Fig. 1 (Turnbull). Fields in a case of optic neuritis of the right eye associated with Bornholm disease (3/1,000 white).

Ophthalmoscopy showed the media to be clear. The left fundus was normal. The optic disc of the right eye was definitely blurred and slightly elevated. No hemorrhages were seen on or about the swollen disc.

Central fields with 3/1,000 white (fig. 1) showed the right field to be generally constricted with a relative central scotoma and enlargement of the physiologic blindspot.

Questioning revealed that about seven to 10 days prior to onset of the ocular symptoms, the patient had had an episode of severe right chest pain associated with a temperature of 99.2°F. but no other physical findings to explain the symptoms. This report was from the internist who had also found that the boy had had a high recurring fever associated with intermittent headaches, right chest and shoulder pains, and subsequent improvement without complications. It was the internist's opinion that he had Bornholm disease.

Further work-up on July 19, 1957, revealed no apparent cause. Physical examination was normal. Chest X-ray studies were normal, as was the hemogram. Erythrocyte sedimentation rate was 10. The urine showed only a few scattered white cells.

Treatment with prednisone (Meticorten) (5.0 mg., three times daily) was begun on July 19th. On July 22nd, the disc appeared less blurred and visual acuity in the right eye had increased to 20/100. The pupillary reaction was the same as the time of the initial examination. On July 26th, the optic disc seemed further improved and the vision had increased to 20/40+. Therapy was reduced to 2.5 mg. of Meticorten, twice daily.

On August 1st, vision was: R.E., 20/25; L.E., 20/20. The disc now appeared almost normal; it even demonstrated some central physiologic cupping. The pupillary reaction to light was now normal. The visual field had returned to normal. There was no longer any discomfort associated with ocular motility.

Discussion

Ophthalmologic texts and literature list numerous etiologic sources of optic neuritis. Toxic, inflammatory, degenerative, and other causes are reported. In a 15-year-series of 240 cases, Carroll relates the etiologic factors as: Infectious, 22 cases; noninfectious (such as anemia, malnutrition, and so forth) 13 cases; toxic agents, seven cases; Leber's disease, 19 cases; vascular disease, 31 cases; multiple sclerosis, 46 cases; suspected multiple sclerosis, 24 cases; neuromyelitis optica, seven cases; unknown, 71 cases. This grouping includes both intraocular neuritis (papillitis) and intraorbital (retrobulbar) neuritis.

Benedict lists similar etiologic findings but feels that multiple sclerosis is an even greater cause than Carroll's figures indicate.

Optic neuritis following viral diseases, such as mumps or measles, is a rare complication but, such viral infections are occasionally encountered as the cause of cases of optic neuritis. Carroll lists three or four such cases in his review. The world literature of the past 10 years lists eight or 10 similar cases but of these only two are in the English literature. One of these followed a case of measles. The other, a case of bilateral optic neuritis, occurred two weeks after chickenpox and there was apparently spontaneous complete recovery over a two-month period.

I have been unable to find any reference to a case of optic neuritis appearing as a complication of Bornholm disease. This disease appears in the literature under a myriad of synonyms: epidemic myositis, epidemic myalgia, epidemic pleurodynia, Devil's grip, epidemic benign dry pleurisy, and so forth. Pickles, who first attached the name Bornholm to the disease (Bornholm island being the site of one of the first publicized epidemics), now says a more fitting name would be Sylvest's disease after Dr. Ejnar Sylvest whom Pickles feels has done more than anyone to promote knowledge of the problem.

The disease is an acute infectious one, characterized by abrupt onset of pain around the lower rib margin and upper abdomen, headache, and fever. Occurring in

warmer weather in epidemic form, it is more common in younger persons. The etiologic agent is believed to be the Group B Coxsackie virus. The clinical course generally runs four to six days to complete recovery without sequelae, unless cases such as the one herein reported represent sequelae.

As to the pathogenesis of the optic neuritis, one can only speculate whether it is due to direct invasion of the nervous system by the virus or is only a toxic manifestation. The rapid response to steroid therapy in the present case tends to favor the toxic reaction.

It is surprising that, in a literature so filled with reports on the use of the steroids, there is such a paucity of papers dealing with the use of this group of drugs in optic neuritis. Kazden and Kennedy report on a comparison of intravenous ACTH and typhoid bacilli in optic neuritis. They found little superiority of one over the other. Other than this there are no reports that I could find in the English literature on the use of steroids in optic neuritis. As noted, the response in this case was dramatic, so dramatic as to rule out a purely spontaneous remission.

501 Woodward Building (3).

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Ophthalmic Miniature

One of the greatest treasures in the library of the Wilmer Institute is the set of the *Transactions of the Ophthalmological Society of the United Kingdom* which once was the property of the great Jonathan Hutchinson—his signature appears on the fly leaf of the first volume which is occasionally embellished by marginal notes in his handwriting.

On page 26 of the report of the first *Transactions* (1881) is a paper by Hutchinson himself, reporting a case of recurrent intraocular hemorrhage in a young adult. The first sentence reads: "Mr. Colin P —, a young man of 23, a native of Devonshire, but for some years employed in a London warehouse, consulted me for the first time in September, 1879." In Mr. Hutchinson's handwriting, on the margin, appears the name of this patient—"Perrit."

Since there is still a continuing controversy on the nature and etiology of this so-called "Eales' disease," and since there is no general agreement on the proper nomenclature, would it not be fitting, even at this late date, to resolve this question of semantics and honor this young Devonshire lad by hereafter referring to his complaint as "Perrit's disease"?

For over a century, physicians have been tagging their own names onto entities they have described, while the patient, in whose reflected glory they shine through the ages, has been relegated to obscurity. What could be more noble than that ophthalmology, at long last, should be the specialty to correct this injustice, and promote the patient to the place of honor!

Alan C. Woods.

SOCIETY PROCEEDINGS

Edited by DONALD J. LYLE, M.D.

NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

April 5, 1957

DR. MAX CHAMLIN, *President*

HAND ILLUMINATOR FOR GONIOSCOPY

DR. ADOLPH POSNER AND DR. MIGUEL MARTINEZ presented a new instrument devised at the Albert Einstein College of Medicine. It consisted essentially of a slitillumination produced through the medium of the usual type of hand ophthalmoscope battery and handle and a monocular viewer giving a magnification of five times. The instrument is used with the Allen or Goldmann gonioscopy lens and is especially suitable for use in the hospital where the patient is in bed or possibly in the operating room or other occasions where the slitlamp is not available or cannot be used.

ROUND TABLE CONFERENCE

Complications of ocular surgery

Discussors: DR. MOACYR E. ALVARO, São Paulo, Brazil; DR. FELICIANO PALOMINO DENA, Mexico City, Mexico; DR. RICARDO F. FERNANDEZ, San Juan, Puerto Rico; DR. JULIO C. RAFFO, Lima, Peru; and DR. JESUS RHODE of Caracas, Venezuela.

Moderator: DR. MAX CHAMLIN

1. *How do you handle hyphema after* (a) *iridencleisis,* (b) *cyclodialysis?*

DR. ALVARO said that blood in the anterior chamber which persists more than three days following operation is usually caused by further bleeding generally due to newly formed vessels in the angle of the healing wound. In the case of iridencleisis he advocated the use of a small ab externo incision, firm wound closure, and a minimum of trauma to reduce the possibility of hyphema. Regarding cyclodialysis, he preferred to do the operation superoexternally and only five mm. from the limbus. In either operation, if there is persistent hyphema, it is very important to investigate the blood coagulation mechanism.

2. *Please discuss the management of common complications in the surgery of congenital cataract.*

DR. DENA enumerated various possible complications:

1. Heavy swelling of the masses of the lens is a frequent complication when the lens capsule opening is small. This may block the pupil and push the iris forward causing secondary glaucoma. This is one reason why linear extraction is preferable to discission.

2. Obstruction of the pupil occurs also as a result of inflammation of the iris causing a small pupil. The inflammation can be modified by cortisone or its derivatives applied locally and orally.

3. Obstruction of the pupil by vitreous or filling of the anterior chamber by vitreous. This must be avoided because of its many consequences (secondary glaucoma, anterior synechias, retinal detachment and so forth). The surgeon must be careful in performing linear extraction to respect the posterior crystalloids.

4. Blockage of the pupil may be:

a. The direct result of surgery, that is, the formation of a thick membrane composed of the remains of capsule and the lens. This can be avoided by extracting the greatest possible quantity of opaque lens tissue and the anterior portion of the capsule. If this is not possible at the time of operation, more surgery will be necessary.

b. The result of inflammation, organized exudate, hemorrhage, or prolapse of the vitreous. Some authors advise a simple discission with deWecker's scissors when the synechias are very thick and multiple and

there is danger of injuring the ciliary body.

5. Displacement and blockage of the pupil and the formation of posterior synechias frequently result from failure of the pupil to dilate well preoperatively. There is general agreement on treating this condition prophylactically by means of iridectomy or iridotomy below, or the combination of both if necessary. It may also follow the early suspension of mydriatics before the lens masses are completely absorbed and the signs of inflammation have subsided.

6. The formation of anterior synechias may result from lack of rapid restoration of the anterior chamber. This is avoided by assuring the formation of the anterior chamber by injecting air into the chamber, by inspection and careful cleaning of the wound at the closing of operation, and by avoiding the use of atropine immediately after the operation, postponing its application until three or four hours later when the anterior chamber is well formed.

7. Detachment of the retina, the most serious of all later complications, besides being conditioned by genetic personal or mechanical characteristics, may be a direct result of prolapse or loss of vitreous following rupture of the posterior portion of the lens capsule. To avoid this, every effort must be made to preserve the posterior capsule. If vitreous prolapses, the fibers should be cut at the level of the wound and air injected into the anterior chamber. Detachment may also be caused by prolonged inflammation of the uvea by the slow absorption of lens material. This can be controlled by the use of cortisone. Repeated discissions, of the Ziegler type, is considered by one authority responsible for 58 to 85 percent of retinal detachments.

8. Numerous other complications may occur less frequently, such as corneal changes, epithelization of the anterior chamber, phthisis bulbi, endophthalmitis, and panophthalmitis.

3. *If akinesia is unsatisfactory, what additional measures can be taken to correct this?*

Dr. Fernandez said that first of all he evaluated the situation to determine what factors are at fault. If the patient is restless or talkative, he reassured him or her that the operation is going smoothly and will be over shortly, repeating this in a gentle voice. If this fails he orders 50 mg. of Demerol. Sometimes the administration of oxygen under a drape helps to control the patient's general behavior. Part, if not most, of this effect is psychological. It may be necessary to postpone the operation. In that case a different preoperative sedation should be used and one should be prepared to use curare if needed.

If the orbicularis remains partially active, he repeats the facial block along slightly different lines from the original injection, using three or four cc. of the same solution, two-percent Xylocaine with Hydase 10 units per cc. He seldom resorts to the O'Brien technique.

In the event that the retrobulbar injection has not produced a good akinesia of the extraocular muscles, he checks the movements of the muscles and injects 0.5 cc. of two-percent Xylocaine or Novocaine along the active muscles. The application of pressure for one or two minutes to the globe after the retrobulbar injection is very helpful in obtaining good akinesia.

4. *Do you feel that the method of wound closure, including the type and number of sutures, is a factor in preventing postoperative hyphema?*

Dr. Raffo said that postoperative hyphema is generaly caused by bleeding from the scleral lip vessels of the incision, from the iris vessels especially when iridectomy has been performed, or from rupture of newly formed vessels during the cicatrization process. Corneal sutures, preplaced or postplaced, assure a firm coaptation of the lips of the wound. One must take care that the sutures do not penetrate more than the superficial third of the lips of the incision, especially when they have to be removed and can easily provoke hemorrhages in the anterior chamber and loss of the aqueous hu-

mor. While preplaced sutures permit perfect coaptation, they are a disadvantage if a complication arises requiring emergency measures. With the new preoperative preparation of the patient and modern anesthetic techniques, it is possible to obtain a good silent vitreous and place sutures after the incision safely.

The possibility of bleeding is not affected by the number of sutures used. Three sutures well distributed in the corneal flap are enough to firmly close the wound. When the lens has been removed, if it is necessary, additional sutures, two or more, could be placed. A better closure of the wound is obtained by suture of a conjunctival flap, or the covering of the wound with a conjunctival flap (Van Lint method). New atraumatic triangular needles are now used with 6-0 catgut to eliminate the difficulties of removing the sutures. The inflexibility of the gut can be counteracted by immersion in water or saline solution and its color may be changed by a dye.

5. *How do you manage iris prolapse after cataract extraction?*

Dr. Rhode said that, when the iris prolapses immediately after cataract extraction, he tries reduction but, if this is unsuccessful, he completes the iridectomy at the same level where the peripheral one was previously made. If a small iris prolapse is found at the first dressing after operation, he prefers to wait a few days, then resect the prolapse iris and close the wound with a few corneoscleral sutures. In the case of a large iris prolapse noted at the first dressing, immediate excision is performed. He takes special care to obtain good akinesia, good retrobulbar anesthesia, and safe corneoscleral suturing. Miotics for therapeutic reduction are not used because they are ineffectual. He emphasized that correct coaptation of the edges of the keratotomy by means of proper sutures is the best safeguard against iris prolapse.

6. *How do you manage an unreformed anterior chamber after iridencleisis?*

Dr. Alvaro stated that this condition is due to (a) detachment of the choroid (in this instance he recommended a posterior sclerotomy by incision or trephination on a bias without taking the piece of sclera out plus the injection of air into the anterior chamber); (b) too large a crystalline lens which, when recognized, should be removed; (c) a defective incision which should be small and made ab externo.

7. *Please discuss the indications and complications of dacryocystorhinostomy in children.*

Dr. Dena said that the operation is indicated in chronic dacryocystitis, the result of congenital dacryostenosis, where treatment by simple probing has failed, and in acquired dacryocystitis. It may be performed when indicated even before the child is one year of age. The earliest case in his experience was at the age of four months. The operation is easier in children because the soft tissues and bones are thinner, bleeding is less, due to greater elasticity of the blood vessels and the presence of less inflammation and degeneration of the tissues, and the tissues have greater resistance (nasal mucosa is not as fragile).

He enumerated the complications:

1. Hemorrhage. In the child it is least in direct relation to the age; almost nil in infants. When it occurs, the bleeding of the angular vessels may be easily controlled by a clamp.

2. Dimensions of the tear sac. The flaps of the sac must be made after those of the nasal mucosa. If the sac is small or too big, adjustments must be made to fit with the nasal mucosa.

3. Wrong placing of the window in the bone. This may be avoided by placing the trephine over the lower inner angle of the orbital rim, perforating through the anterior lacrimal crest and bone, perpendicular to the plane of the nose. An eight-mm. trephine is used in preschool children and 10 mm. trephine for the older child.

4. Tearing of the soft tissue is avoided by protecting the tissues and the tear sac

with a periosteal elevator, separating them widely with skin hooks and, better using a Stryker oscillating saw.

5. Displacement and deformity of the structures. The dissection of the tissues must not be extened beyond the posterior lacrimal crest because there is a risk of severing Horner's muscle which causes displacement of the inner canthus, eversion of the lacrimal punctum, and loss of the pumping action of the muscle.

6. Difficulty in identification of the sac may be avoided by passing a Bowman's probe through the lower canaliculus, making a bump in the walls to serve as a guide.

7. Later hemorrhage may occur more than 24 hours after the operation and may be avoided by stopping the bleeding carefully, forbidding the patient to blow the nose, cough, or sneeze violently in the first 24 hours after operation. A very tight dressing must be bound over the wound during the first 24 hours.

8. Another complication in the postoperative period is tearing during the 24 hours after the first dressing. This is corrected by passing saline solution or solution of an antibiotic through the canaliculus to the nose. The risk of infection has become of secondary importance since the use of antibiotics.

8. *In case of vitreous loss, what procedures do you advise beside resecting the extruded vitreous and tying the sutures?*

Dr. Fernandez said that the principal weapon against vitreous loss is prevention of its occurrence. The most valuable measure is the placing of a central suture which may be drawn tight by a single movement in case of vitreous presentation and often suffices to hold the vitreous in the anterior chamber without prolapsing outside the incision. I have used two different sutures for this purpose: the simple corneoscleral suture at the 12-o'clock position with a large knot at the corneal side about an inch from the end and the double armed corneoscleral type employed by Scheie which, if unused for this purpose, is converted into two single sutures by dividing the loop of the mattress and passing the needle back through the base of the conjunctival flap. I prefer the first for its simplicity and easier handling in emergency.

Relief of all possible tension on the globe is the next most useful step. As I never use a speculum in cataract surgery this amounts to relieving the pull of the superior rectus suture and also that on the inferior lid. The first is held only by the weight of a serrafine and the latter by that of a small mosquito clamp.

If the eye becomes soft after tying the sutures, additional corneoscleral sutures are placed, and a thin spatula is introduced near the temporal end of the wound and run along the limbus past the midline and with one downward sweeping movement the vitreous and, with it, the upper iris are swept down. After this, air is injected into the anterior chamber to hold back the vitreous.

9. *How do you manage a totally drawn-up pupil after cataract extraction?*

Dr. Raffo said that the most common cause of a drawn-up pupil is the inclusion of the iris in the incision. I usually use the blunt point of a strabismus hook to press the cornea during operation to keep the iris out of the incision. Irrigation of the wound area is also a great help especially when the iris has normal elasticity.

A badly located suture is another cause for deviation of the pupil. With a partially prolapsed iris the suture can include the iris and fix it in one position, and this can be avoided by careful examination of the sutures before trying them.

Capsular or lens residues included in the wound may also fix the pupil. Severe trauma to the iris may be another cause and vitreous prolapse yet another.

A careful toilet of the wound is the answer to most of the causes for deformity of the pupil. In introducing air into the chamber, make sure that it is not insinuated behind the iris. I instill two-percent pilocarpine

or weak eserine solution at the end of the operation and this helps to retract the iris.

Unfortunately, in spite of all the careful attention to details mentioned, a deviated pupil is sometimes disccovered at the first postoperative dressing. This is caused by the patients carelessness or unco-operative behavior and, in these cases, nothing can be done to restore the pupil to its normal position. I usually do the first dressing on the fourth day.

10. *How do you manage a subluxated lens due to complicated cataract, such as after trauma or uveitis?*

Dr. Rhode said that, in the case of trauma, a slight subluxation with a partially or totally clear lens is treated expectantly with observation of the position of the lens and the intraocular pressure. If opacities appear in the lens or the tension rises, he proceeds to extraction with a Snellen loop and does an iridectomy. When the subluxation occurs during uveal disease, treatment is started and if the uveitis responds favorably and no complications arise, the cataract is extracted at a later date. If therapy fails and the eye becomes worse because of rising intraocular pressure or additional disturbances, he proceeds to extraction with Snellon loop and iridectomy, warning the patient or his relatives of the poor prognosis.

11. *How do you manage an unreformed anterior chamber after cataract extraction?*

Dr. Alvaro enumerated the possible etiologic factors: (a) defective apposition of wound lips due to insufficient sutures (catgut sutures are superior to silk which sometimes acts as a drain); (b) defective toilet of the wound before tying the sutures, allowing remnants of lens capsule, and so forth, to remain; (c) detachment of the choroid; (d) excessive trauma on the ciliary body, impairing aqueous secretion. The same principles of management mentioned previously apply here.

12. *How do you manage complications of penetrating wounds of the anterior segment in children?*

Dr. Dena said that the prognosis of penetrating wounds in the anterior segment has greatly improved, modifying the classical concept which caused a great proportion of eyes to be sacrificed because of the fear of sympathetic ophthalmia. Sympathetic ophthalmia has almost disappeared and the number of eyes saved in young patients is almost 100 percent since, even when the function of the eye may be impaired, it is kept in place to stimulate the growth of the orbit and face at the same time prevent psychic trauma.

As a general rule healing of corneal wounds in children is three times as rapid as in adults. The same principles of therapy apply as in the adult.

The measures used for the commonest complications in corneal wound surgery were described:

1. Delayed restoration of the anterior chamber. All wounds bigger than three mm. have to be sutured. Direct corneal sutures are preferred to a conjunctival flap which hides the wound and is only used when the wound is very big, with irregular or macerated edges. Silk (6-0) is preferred to catgut. Accurate apposition of wound edges is obtained by passing the sutures through one-half the thickness of the cornea.

2. Hyphema. Bleeding in penetrating injuries is less serious than in blunt injuries; the anterior chamber should be carefully washed out before closing the wound, leaving air in the chamber.

3. Prolapsed iris. The iris should be conserved, putting as much as possible back in place. Excision must be kept for the case in which a great part of the iris has remained exposed for an excessively long time or in which the iris is lacerated.

4. Anterior synechias. These maybe prevented by injection of air into the chamber and treated, when once they have formed, by the introduction of a fine spatula into a tiny limbus incision or the sides of the wound according to McDonald's technique.

In the case of wounds involving the limbus, a conjunctival flap is utilized in addi-

tion to the direct suturing. If the position of the wound has allowed a prolapse of the ciliary body or even the choroid, the prolapsed tissue is replaced by means of a spatula, the sutures previously placed are gently tied, and diathermy is applied around the treated zone.

In cases of traumatic cataract, which is a frequent complication, if the lens damage is not extensive and the lens is not swollen, treatment of lens is postponed until the wound has healed. If the damage to the lens is very severe, the lips of the wound must be carefully cleaned to prevent lens material from remaining in the wound and the treatment of the lens is postponed until later. Generous local and systemic use of antibiotics and steriods is indicated. Tetanus antitoxin is prescribed if there is any reason to suspect this type of infection.

Jesse M. Levitt,
Recording Secretary.

COLLEGE OF PHYSICIANS OF PHILADELPHIA

Section on Ophthalmology

October 24, 1957

Dr. I. S. Tassman, *Chairman*

Recurrent hemangiopericytoma of orbit

Dr. Edmund B. Spaeth and Dr. Antonio Valdes-Dapena (by invitation): A man had his right eye enucleated in 1951 because of an ocular lesion which proved to be hemangiopericytoma. There was a recurrence in 1953, for which a complete exenteration of the orbit was performed. Some plastic reconstructive surgery of the orbit permitted the wearing of a prosthesis. In spite of 4,000 r of X-ray therapy, a recurrence necessitated the removal of all the bony tissues of the orbit, exposing the dura. Sixteen radon seeds were implanted followed in three months by two separate lesions. These nodules were resected and the wound packed with 10 radium capsules giving an estimated dosage of 5,000 mg. hours. Six months later, that is at present, the patient is again showing a recurrence which will probably prove fatal. The left eye is now immobile with exophthalmos, apparently due to intracranial extension through the middle fossa.

The morphology and significance of the pericytoma cell with regard to its position in the lesion were discussed, giving the credit to Stout for the present knowledge of this lesion. Comment was made regarding the X-ray and radium resistance of the tumor cell, as well as the method of extension.

Ocular cystinosis

Dr. William C. Frayer and Dr. Hugo E. Martinez-Roig (by invitation): Three patients with ocular storage of cystine crystals associated with dwarfism and vitamin D-resistant rickets were reported. Crystals were found in the anterior stroma of the cornea, on the corneal endothelium, in the conjunctiva, and in the iris. Ocular cystinosis frequently accompanies the type of dwarfism and rickets seen in the Franconi syndrome. It is apparently the result of a disturbance of amino-acid metabolism. The diagnosis should be suspected in all patients with rickets, and the corneal crystals can be seen easily with the ophthalmoscope. Recent evidence indicates that cystine storage with or without aminoaciduria can be found also in otherwise healthy adults.

Pathogenesis of the retinopathy of prematurity

Dr. Francis P. Furgiuele (by invitation): The overwhelming evidence gained from animal studies incriminates oxygen as the important factor in the etiology of retrolental fibroplasia. In view of the selective, unique response which oxygen exerts on growing retinal vessels, factors governing retinal vessel growth as yet unknown may also be responsible. This fact is of medicolegal importance. The manner in which oxygen appears to exert its effect in the pathogenesis of this disease has been discussed.

William E. Krewson, 3rd,
Clerk.

AMERICAN JOURNAL OF OPHTHALMOLOGY

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PROGRESS OF AMERICAN OPHTHALMOLOGY

Fifty years ago Hubbell published a booklet on ophthalmology in America in which he predicted on the last page that "when sufficient endowment of schools, teachers, and laboratories is provided to meet the needs of research teachers and students, and of experimental pathology, etiology, and therapeutics, American ophthalmology will lead and not follow." The prophecy is now happily fulfilled; American ophthalmology is in a golden period both literally and figuratively. Never before has research been subsidized so generously by government, industry, and lay philanthropy. The Association for Research in Ophthalmology, an organization concerned exclusively with basic re-

search, met just one day per year when founded by Conrad Berens 25 years ago; currently the contributions fill several two-day regional sessions besides an annual four-day conference. The three older national societies, represented by the American Ophthalmological Society, created in 1864; the Section on Ophthalmology of the A.M.A., initiated in 1878; and the American Academy of Ophthalmology and Otolaryngology, organized in 1896, place the major emphasis on clinical investigation.

In Hubbell's time, America was a debtor nation both in economics and in ophthalmology. A dramatic illustration of the shift in scientific hegemony is the statistical fact that in 1905 all the Nobel prizes were awarded to Germans while in 1946 the United States took all the honors. Thanks to American influence, English is now the predominant language of science.

When ophthalmology came into flower a century ago, Americans flocked to study under Bowman and Critchett in London, under Desmarres and Sichel in Paris, under Donders and Snellen in Holland, under Arlt and Jaeger in Vienna, and under the inspired von Graefe in Berlin. Among the consequences was the establishment of independent departments of ophthalmology in the various medical schools—Cincinnati, 1860; Bellevue, 1868; Rush, 1869; Northwestern, 1870; Harvard, 1871; Pennsylvania, 1872. Inspired by London's Moorfields, Delafield and Rogers founded the New York Eye and Ear Infirmary in 1821, Reynolds and Jeffries established the Massachusetts Eye and Ear Infirmary in 1824, and the Wills Eye Hospital opened in 1832, the New York Ophthalmic Institute in 1852, and Illinois Eye and Ear Infirmary in 1858, the Knapp Memorial Eye Hospital in 1868, and the Manhattan Eye and Ear Hospital in 1869. By World War I, America had 58 hospitals and infirmaries specializing in the treatment of the eye. Most of these eventually became affiliated with universities; and the affiliation resulted in a new pattern of systemized ophthalmic research, the ophthalmic institute, in which America has been the guide. Notable examples are the Wilmer Institute, Oscar Johnson Institute, Howe Laboratory of Ophthalmology, Institute of Ophthalmology of Columbia University, Kresge Eye Institute, Proctor Foundation for Research in Ophthalmology, Doheny Foundation, Research Department of Wills Eye Hospital, John E. Weeks Memorial Laboratory for Research in Ophthalmology, Mayo Foundation, Laboratory for Research in Ophthalmology of Western Reserve University, and the National Institutes of Health. In 1957, the National Committee for Research in Ophthalmology and Blindness was organized for the integration and stimulation of research. It provides a list of the sources of funds and of current projects, and helps the interested with advisory assistance.

The Wills Eye Hospital, which recently celebrated its 125th anniversary, was the first American Hospital to be devoted solely to eye care and is still the largest hospital of its kind in the country. Its research laboratory, dedicated in 1950, includes 20 full-time investigators. The hospital has affiliations with Jefferson Medical College and the Graduate School of Medicine of the University of Pennsylvania; and also gives a postgraduate course in ophthalmic nursing. Recognition should also be made of the centennial of the Illinois Eye and Ear Infirmary, founded in May, 1858, which is now essentially the ophthalmic institute of the University of Illinois.

Less than 50 years ago many physicians could label themselves oculists after four to six weeks in a postgraduate school. This equivocal situation was ended by the American Board of Ophthalmology, installed in 1917. Since then certification by the Board has become a prerequisite for professional recognition, hospital appointments, and society memberships. To meet the prescribed standards thorough postgraduate courses have been established, and the residency in ophthalmology has been extended to two

years or longer. The Board has spurred better surgical training, stimulated the study of ophthalmic literature, and motivated an increased interest in physiologic optics, perimetry, practical refraction, and all other phases of ophthalmology.

Lawrence, in his treatise on the eye (1833), inscribed: "The whole field of medicine and surgery must be laid under contribution for the principles which are to guide us in learning the nature and treatment of ophthalmic disease." Ophthalmology has gained immeasurably from the introduction of sulfonamides, antibiotics, anticoagulants, antihistaminics, corticosteroids, tranquillizers, and other agents of effective chemotherapy, from the advances in local and general anesthesia and from improved surgical equipment such as the dermatome, Strycker oscillating saw, and micropoint swagged needles. In 1887 the American Ophthalmological Society recommended compulsory Crede prophylaxis—the first official recognition of its importance by any such society in any country. By 1908, 15 states had enacted such laws. The rare case that now escapes prophylaxis is promptly cured by penicillin. Specific chemotherapy has materially altered the prognosis of tuberculous choroiditis. Acquired toxoplasmosis, until recently confused with tuberculous choroiditis, frequently responds to Daraprim and sulfadiazine (Eyles and Coleman, 1953). Central serous choroidosis due to amebiasis (Braley and Hamilton, 1957) yields to prolonged anti-amebic therapy. Fever therapy has been almost dislodged by the corticosteroids to which many inflammatory and allergic diseases of the eye respond more effectively. Intensive corticosteroid therapy has proved to be the first really successful treatment for sympathetic ophthalmia, though of no value prophylactically (McLean, 1958). Vigorous steroid therapy also offers the best hope for sarcoidosis, cranial arteritis, thyropathic exophthalmos, and the focal arteriolitis of Klien (Jensen's juxtapapillary choroiditis).

Henry W. Williams was the first to advocate closure of the cataract incision by suture. In 1869 he wrote: "The advantages of the corneal flap may be much enhanced, and its dangers materially lessened, in my judgment, by the use of a suture to retain in apposition the edges of the wound." As the intracapsular extraction became routine, sutures became obligatory. Dunnington's work on ocular wound healing has demonstrated that appositional sutures result in an earlier and firmer closure of the anterior chamber, with a consequent decrease of postoperative complications. Better local anesthesia and akinesia and a softer eye have been effected by the addition of hyaluronidase to the anesthetic solution (Atkinson, 1949). The Bell erisophake and its modifications have simplified the intracapsular extraction of intumescent cataracts. Current statistics indicate that modern cataract surgery restores excellent vision in 95 percent of cases.

In 1942, the American Academy of Ophthalmology and Otolaryngology embarked on the standardization of tonometers. As a result reliable interconvertible readings are now obtainable with different certified tonometers. Many advances were instigated by the project, including the Sklar modification of the Schiøtz instrument, the electronic tonometer, and the 1955 Friedenwald calibration which closely approximates the true intraocular pressure and insures concordant measurement with different loads for eyes of average rigidity. Utilizing the electronic tonometer, Grant in 1950 introduced what he named tonography as a means of accurately measuring the facility of aqueous outflow. Other contributions to the glaucoma problem are equally noteworthy. Hasket Derby made the first report on acute glaucoma precipitated by mydriatics (1868). The late Otto Barkan elaborated the goniotomy operation for congenital glaucoma which resulted in better and more lasting results than previous procedures. He awakened also a better understanding of

the glaucomas by insisting that glaucoma simplex and closed-angle glaucoma are separate entities having in common only an increase in intraocular pressure. The key structure in glaucoma simplex is the trabecular network, studied most recently by Rones (1958). Vail's suggestion that iridectomy in essential atrophy of the iris forestalls the otherwise intractable glaucoma (1955) has been fully confirmed. Leopold has introduced powerful new miotics, Floropryl (DFP), 1946, and phospholine iodide (1957), which seem especially valuable for the glaucoma that supervenes after cataract surgery. Becker, inspired by the Friedenwald-Kinsey secretion-diffusion theory of aqueous production, found that the oral administration of acetazolamide (Diamox), a carbonic anhydrase inhibitor, suppressed aqueous secretion with a consequent reduction of intraocular pressure. This 1954 discovery ranks as the greatest medical aid to glaucoma since the advent of miotics (eserine, 1876; pilocarpine, 1877).

American ophthalmology has freely adopted and elaborated the ideas and inventions of Europe. The reflecting ophthalmoscope, first brought to America by Elkanah Williams in 1855, was perfected by Loring (1869) and its successor, the electric ophthalmoscope, was conceived by Dennett (1885). Derived from Snellen's card are the projectochart and rating machines; from Cuignet's retinoscope, the streak retinoscope; from the Stokes lens, Jackson's cross-cylinder (1893); from Javal's clock dial, precise astigmometers; from Fronmueller's trial case, the mechanical refractor; from von Graefe's campimeter, Lloyd's stereocampimeter, Spaeth's magnetic campimeter (1954), and the tachystoscopic campimeter (Harrington and Flocks, 1954); from flicker fusion by a rotating sectored disc, the electronic Strobotac; and from the blown contact glass of Mueller, the plastic, fluidless corneal lens. Our pervasive curiosity continues and a Translation Center at the Crerar Library of Chicago provides translations (Russian included) on almost any specific subject.

Medical advances have had, as an unfortunate by-product, the occasional production of iatrogenic diseases, none of which has been more devastating than the retinopathy of prematurity. This was first described by Terry (1942) under the label, retrolental fibroplasia. The disease became a predominant cause of blindness until Patz (1953) demonstrated by animal experiments that the overuse of oxygen was the principal factor in its production. Other conditions discovered by Americans include lipemia retinalis (Heyl, 1880), the bacillus of pink eye (Weeks, 1886), amaurotic family idiocy (Sachs, 1887), Duane's retraction syndrome (1905), and the oculoglandular form of tularemia (Derrick Vail, Sr., 1914).

The evolution of the bifocal has been an exclusively American gift to ophthalmic optics from the initial idea of Benjamin Franklin (1784) to cement wafers (Morck, 1884), the fused bifocal (Borsch, 1908), and one-piece types (Bentzon and Emerson, 1910). Various new forms, including trifocals, have achieved current acceptance. In 1863, Derby reported four cases of astigmatism for which the prescriptions were ground in Berlin. After Weir Mitchell emphasized the relation of asthenopia to headache, neurasthenia, and functional gastic disorder (1874), Americans have become supremely eye conscious. As a result the public demands and receives the best possible eye care, more and better refractions, and the finest ophthalmic lenses. In 1890, Prentice advocated the metric system of numbering and measuring lenses, which has stimulated clinical investigations of ocular motor imbalance. White demonstrated the anisophoric character of most hyperphoria (1932), and Olsho stressed its importance in dealing with unlike vertical effective powers (1939). Optical compensation, when indicated, can be readily attained now by dissimilar segments, slab-off, or prism segments. The regard for maximum utilization

of vision has resulted in the constant visual screening in schools, sight-saving classes, low vision aids, and industrial ophthalmology—undertakings championed by the National Society for the Prevention of Blindness, founded in 1908. A natural sequence of the intimate insight in reading mechanism obtained by the portable binocular eye movement camera (E. A. Taylor, 1937) and the galvanometric method of recording eye movements (W. R. Miles, 1939) has been training apparatus to promote fast and accurate reading habits. The doctrine of Luckiesh that better light means better sight has gained approval in home, school, and factory. The medicolegal determination of visal efficiency has been established on a rational basis (A. C. Snell, 1925). The diagnosis of aniseikonia by the space eikonometer and its correction is another accomplishment that is wholly American.

Wherever and whenever worthy operations originate they have been zealously studied, as exemplified most recently with the Russian device of relieving xerophthalmia by transplanting the parotid duct to the inferior cul-de-sac (Bennett and Bailey, 1957) and with Strampelli's idea of the anterior chamber acrylic lens (King and Skeehan, 1957). Supplementary lamellar resection, suggested by Lindner in 1946 for those cases of retinal detachment in which the classical diathermy operation is unlikely to be successful, has been elaborated to scleral buckling alone or with encircling material such as polyethylene tubing (Schepens, 1955), nylon, or No. 5 chromic gut (Dellaporta, 1957). An important alternative is Shafer's injection of sterile human vitreous (1956) which like corneas for transplantation is now procurable from the eye-banks established in the larger cities. Diathermy has been extended to the destruction of small flat tumors in the periphery of the fundus (Dunphy, 1957) and to the obliteration of vessels in Eales' disease and angiomatosis retinae. Jameson first outlined the principles of muscle recession and proved that suturing of the recessed muscle directly to the sclera was innocuous (1922). Since World War II surgical measures for oblique muscle defects have been perfected, disproving the contention that surgery on the obliques was not feasible. In extreme thyrotropic exophthalmos, surgical decompression of the orbit through the lateral approach has displaced the Naffziger operation. The transcranial approach for the removal of tumors in the posterior part of the orbit is the most logical and effective (Dandy, 1941). The diagnosis of orbital tumors may be assisted by pneumatography and that of intraocular tumors by the increased uptake of radioactive phosphorus. American innovations still in widespread use are electrolytic epilation in trichiasis (Michel, 1875), localization of foreign bodies by the Sweet method (1898) since supplemented by the Berman electronic localizer, the McReynold's pterygium operation (1902), and delimiting keratotomy (Harold Gifford, 1922).

The excitement that attended Horner's discovery of the tensor tarsi (1822) in the early days of American ophthalmology reflects the ever-present regard for basic research. The ophthalmoscope has been used in every field of medicine from genetics (Falls) to the signs of death (Kevorkian, 1956). The trail-blazing contributions to the biochemistry of cataract include the discovery of the mineral changes (Burge, 1909), lenticular autolysis (Clapp, 1911), immunologic analysis (A. C. Woods, 1930) and the composition of the lens proteins (A. C. Krause, 1932). Since the advent of the atom bomb, radiational cataract and lenticular metabolism have been intensely investigated. Selig Hecht has shown that the minimum energy required for night vision corresponds to only five to 14 quanta absorbed by the rods. The cultivation of viruses on the chorioallantoic membrane of the developing hen's egg (Goodpasture and Woodruff, 1931) has been extended to the viruses affecting the eye. Breinin is using electromyography as a new tool in ocular

and neurologic diagnosis. Wolter, by means of the Hortega method of staining, is amplifying our knowledge of the ocular tissues in health and disease. Noteworthy also are the studies on rhodopsin by George Wald, on hyaluronic acid (first isolated from bovine vitreous in 1934) by Meyer, and of ocular pathology by Algernon Reese. In a minor research, Grant (1952) discovered the first effective treatment for lime burns of the cornea—the chelating agent, sodium versenate (EDTA).

Postgraduate courses on recent advances of ophthalmology are an annual event in every section of our country. Within the past 100 years the virginal land of America has become an empire of progress.

James E. Lebensohn.

OBITUARIES

LAWRENCE T. POST
(1887-1958)

LAWRENCE T. POST

Lawrence Tyler Post, 70 years of age, died Tuesday, May 13, 1958, after a protracted illness. A cerebral thrombosis in May, 1953, resulted in extensive paralysis and partial loss of speech, but no loss of memory or mental capability. In January of this year, a second stroke caused almost complete paralysis and coma, which persisted until the time of his death. In his passing, ophthalmology has lost one of the staunchest supporters of the highest and best in medicine; one who always stood for what he thought was right, yet one who weighed all sides of a question with care before arriving at a final judgment.

Dr. Post was born in St. Louis, Christmas Day, December 25, 1887. His father was Martin Hayward Post, an outstanding ophthalmologist of his generation, president of the American Ophthalmological Society at the time of his death in 1914. His mother was Mary Lawrence Tyler, daughter of a well-known family, both in Louisville, Kentucky, where she was born, and St. Louis, her adopted home. His grandfather, Truman Marcellus Post, the first Congregational minister in St. Louis, and his grandmother, Frances Henshaw, migrated to the Middle West from Vermont.

He received his early training at Smith Academy in St. Louis, from whence he went to Yale University, graduating with the degree of A.B. in 1909. Four years later he was graduated from The Johns Hopkins Medical School, and the next year was surgical intern in the same institution. The following year he became assistant to Dr. James Bordley, doing most of his work in the South Baltimore Hospital.

His desire, however, to return to St. Louis, where he had many ties, persisted, so that, following the death of his father, when his help was sorely needed at home, he returned to the city of his birth to become associated with Doctors A. E. Ewing, William E. Shahan, and his brother, M. Hayward Post, Jr. The affiliation with his

brother continued with rare satisfaction to both until the time of his incapacitation.

Upon his return to St. Louis, he not only began his private practice, but also made his first connection with the Eye Department of Washington University, to which institution he was destined to make such a large contribution, developing the Department of Ophthalmology into one of the outstanding eye services of America.

His capabilities were varied. At play he could relax completely, at such times showing a keen, puckish sense of humor, an attribute definitely inherited from his father. Larry was a good companion and full of fun. He had a remarkable ability to make friends and hold them. He loved a good story. And how he did love a song-fest! His contribution, it must be admitted, was often more boisterous than harmonious. He took part in many sports and was good at them, as he had excellent co-ordination. At Yale, he was a member of the tennis team, and his ability at baseball and golf was above the average. It could be said of him that whatever he did, he did to the full extent of his ability. He worked hard and he played hard.

He was a firm believer in the value and necessity of thorough postgraduate training for young men entering upon the study and practice of the medical specialties, and maintained courses, as head of the Department of Ophthalmology of Washington University, for this training in ophthalmology when few such were available elsewhere. He laid the foundation for a fine ophthalmologic training center in Washington University and surrounded himself with an excellent staff of house officers and consultants; and in both these groups there was unusual co-operation and absence of friction. At all times he kept himself easily accessible to those working with him.

Second only to his love for the teaching of ophthalmology, was his devotion to THE AMERICAN JOURNAL OF OPHTHALMOLOGY, of which he was an associate editor from 1922 to 1945; editor-in-chief from 1931 to 1940; and acting editor-in-chief from 1942 to 1945. In 1945 he was appointed consulting editor in which capacity he served with distinction until his death. In the same connection, he was president of the Ophthalmic Publishing Company in the year 1941.

In the spring of 1916, he became affiliated with Base Hospital Number 21 from Washington University School of Medicine. The idea at the time of its inception was that the unit might be needed for services on the Mexican border. This never materialized, but about May 16, 1917, the hospital was ordered overseas to France, and a final ceremony was held at Christ Church Cathedral for the blessing of the colors. Shortly afterward, the unit sailed for France, along with four other base hospitals, the first of the American Expeditionary Forces.

An interesting sidelight upon the haste of their departure, only five days after receiving the order to move, and also the early date of their arrival in England relative to other units of the American Expeditionary Forces, was the fact that they were at first refused permission to debark at Liverpool because one and all lacked proper credentials in the form of passports.

Larry held the rank of captain at that time but later on was commissioned major. The hospital was stationed at Rouen, where it functioned actively during the remainder of the war. In the later months of the campaign, he was detailed to service in command of Mobile Hospital Number 4, and in this capacity was active immediately behind the front lines for a short time, until the signing of the armistice.

Many of the deepest friendships of his life were formed with the officers and men of this unit, and where there were many very serious and strenuous hours, there were also, now and then, times of conviviality, which he enjoyed, and concerning which he reminisced to the end of his life. It can be said that the experiences and friendships formed at that time had a deep

influence on the whole remainder of his days.

He was professor of clinical ophthalmology and head of the Department of Ophthalmology of Washington University from 1931 to 1953, and ophthalmologist-in-chief, Barnes and Allied Hospitals, from 1933 until the time he retired, in accordance with the rule of the university, at the age of 65 years.

A symposium and banquet in his honor were held on March 27 and 28, 1953, preceding the date of his official retirement on July 1st of that year. During the two days of the meeting, a number of scientific papers were read by distinguished ophthalmologists from all over the United States. The banquet was attended by approximately 1,000 of his friends and colleagues. On this occasion, a portrait of Dr. Post, commissioned by a group of associates and former members of the house staff, was presented to the Department of Ophthalmology of Washington University School of Medicine.

THE AMERICAN JOURNAL OF OPHTHALMOLOGY honored its former editor-in-chief by designating volume 36, number 9, September, 1953, as *The Lawrence T. Post Issue* and publishing in that issue all papers read upon the occasion.

During the course of the proceedings, Larry remarked in an aside, "Such things are never done until one has passed away." Less than two months later he was disabled by his first cerebral accident.

His affiliations were many and, as a rule, he took an active part in those organizations with which he was associated. He became a member of the American Ophthalmological Society in 1924, was elected its vice-president in 1950, and president in 1951. He early became a member of the American Academy of Ophthalmology and Otolaryngology, of which society he was vice-president in 1924 and president in 1944. He was honor guest of the Academy in 1953. He was chairman of the Section on Ophthalmology of the American Medical Association in 1941, past chairman of the Eye Section of the Southern Medical Association, and past president of the St. Louis Ophthalmological Society. He was a fellow of the American College of Surgeons, and a member of numerous other medical societies. He was a member of Sigma Xi, Zeta Psi, and Phi Beta Pi.

His contributions to ophthalmic literature were many, both in the form of papers read before the various societies with which he was affiliated, and also as editorials in THE AMERICAN JOURNAL OF OPHTHALMOLOGY. In many of these contributions he fought fearlessly, yet fairly, for the proper relationship between ophthalmology and optometry, and was instrumental in obtaining a better understanding between the two groups.

He was co-author of ophthalmologic and otolaryngologic military surgical manuals, and consultant to the Veterans Administration. In 1941, he was appointed a member of the ophthalmological committee of the National Defense Surgical Advisory Committee.

He received the Howe Medal of the American Ophthalmological Society in 1947, and the Dana Medal in 1949.

His social clubs were the St. Louis University Club, the St. Louis Country Club, the Round Table Club of St. Louis, and the Pithotomy Club of Baltimore.

Dr. Post is survived by his wife, Bernice Lightner Post, who in no small degree helped him throughout their entire married life in the many activities of his professional career, and stood by him faithfully during the final devastating years of his long illness. In addition to Bernice, three sons survive him, the eldest of whom, Lawrence T. Post, Jr., whose training stemmed from Yale University, Washington University School of Medicine, and three years in residence in the Department of Ophthalmology of The Johns Hopkins University, is carrying on the tradition of ophthalmology, both in private practice in as-

sociation with his uncle, M. Hayward Post, and in affiliation with the Department of Ophthalmology of Washington University; a second son, Stephen Lightner Post, graduate of Princeton University and the Medical School of Columbia University, is now specializing in the study of psychiatry; and a third son, Robert Henshaw Post, also a graduate of Princeton, is now in his second year of medical school at Cornell.

M. Hayward Post, Jr.

Lawrence T. Post became editor-in-chief of THE JOURNAL in July, 1931. He relinquished this position in January, 1940. During that time he wrote many editorials on many subjects pertaining to ophthalmology, some of them scientific and others socio-economic, all of them written with skill and integrity and with influence for good. He was honest and forthright. He always favored the younger men and the beginners in ophthalmology and encouraged them to write and to contribute. I have chosen the following editorial, one of his earliest ones, to reprint here in his memory. (Ed.)

THE ROUTINE EXAMINATIONS OF PATIENTS

WITH SPECIAL REFERENCE TO THE PHORIAS

(Am. J. Ophth., 14:1173 [Nov.] 1931.)

Every ophthalmologist has to decide just what tests to include in his routine examination of patients whom he has not seen before. There are a great number of tests that might be made but many of them would be unnecessary and the factor of time consumed is vital to both patient and physician. On the other hand it is essential that no important feature in the case be overlooked.

In the beginning of his practice the physician has usually a superabundance of spare moments and can include many special examinations which later he will drop from the routine.

It may be argued that each case is individual and that no routine handling of patients is ever justifiable. In one sense this is undoubtedly true but it is safe to say that 90 percent of patients come to the ophthalmologist with a complaint of eye strain, headache, or poor vision, any combination or all of these, and of nothing else. It is for these patients that a routine must be established when a practice has assumed large proportions.

To attempt to decide for anyone but himself of what this routine should consist would probably result in complete disagreement and the effort to do so would be folly, but about certain of the procedures there can be no question. The taking of a careful history, the meticulous and painstaking refraction by whatever method the practitioner has found most satisfactory in his own hands —what a world of controversy there has been on that subject!—ophthalmoscopic examination and observation by diffuse and oblique illumination, date back to the infancy of ophthalmology and certainly have always been a part of every eye examination that even pretended to be complete, since the discovery of the ophthalmoscope. For many years it may be hazarded that this and little else constituted the routine test of the usual patient.

Soon after the careful work of Donders and others on refraction in the middle sixties of the nineteenth century, attention began to be focused on the extraocular muscles. Obviously strabismus had been known and attempts made to cure it since earliest times but it was not until after 1880 that the importance of ocular imbalance, other than strabismus, began to be appreciated. In this country probably the pioneer work of Gould had the greatest influence on the profession. Since then it is safe to say that an increasing amount of thought has been given to this matter. In more recent years the idea of muscle exercises has been exploited—often rather obviously from an unworthy motive by optometrists and those even less well informed—until laymen have heard so much about them that ophthalmologists are frequently asked whether they use this method of treatment. Suffice it to say at this point that examination of the muscle balance has definitely become a part of the ophthalmic routine.

Whenever a man makes a special study of

some feature of examination he is apt to become enthusiastic about it. He sees possibilities in it that his less eager confrere overlooks. He picks up pathology that has been missed by others and unsuspected by himself until discovered by use of the procedure in which he is especially interested. If this happens sufficiently often, he becomes convinced that this particular test should never be overlooked. An ardent advocate of the slitlamp thinks that every new case should have a slitlamp examination. Visual fields taken as a routine will indicate unsuspected lesions once in a while that would otherwise be missed, as will also the routine use of the tonometer.

A beautiful piece of work was shown at the meeting of the American Academy of Ophthalmology and Otolaryngology this fall which would suggest that an occasional cause of asthenopia is difference in the relative size of objects in the two eyes. Possibly here is another test to be added some day to the routine.

No expression of opinion as to what tests should be made routine will be hazarded here. Even if every patient would tolerate all of those mentioned above and other tests, too, there would be few who could afford to pay an adequate compensation for the time which the ophthalmologist or his assistant must spend in making them.

In this number of THE JOURNAL there is a discussion (by Dunnington, p. 1140) of hyperphoria as a cause of ocular discomfort in which it is maintained that hyperphoria should be measured in the six cardinal positions of the eyes, as hyperphoria is usually paretic and only by such a method can suitable prismatic correction be determined; and that a frequent cause of difficulty is the prescribing of prisms which correct a hyperphoria present on looking straight ahead but disappearing when looking down, as in reading, consequently the prismatic correction causes asthenopia in reading by over-correcting the hyperphoria in this position.

There can be no question about the nonconcomitant nature of hyperphoria and certainly the measuring of it should be done not only on looking straight ahead but also on looking down, as the prescription will vary according to this finding. A frequent difficulty is that the phoria is different in every position of the eye and consequently prismatic correction is very uncertain. Occasionally the use of a prism in the reading segment different from that in the portion of the glass designed for distance is helpful.

It is important in testing the lateral phorias that some method be used which will be efficacious in separating the convergence associated with accommodation in near testing. The dissociation with prisms is much less complete than that with a multiple Maddox rod before one eye and a small point of light as a fixation object.

Just how much good muscle exercises will do is also a moot point. Most ophthalmologists agree that little or nothing can be done by exercise toward adjusting a hyperphoria but that more or less can be done with the lateral phorias.

There are those who contend that muscle exercises of a general nature are valuable in asthenopia. An interesting instrument was shown at the meeting of the American Ophthalmological Society last spring and again at the American Academy of Ophthalmology and Otolaryngology this fall. Specially constructed discs were made to revolve and were displaced by rotating prisms before the patient's eyes. The demonstrator felt that some of his patients have been much relieved by use of this instrument.

Whatever may be the decision with regard to including in the routine many of the special tests there can scarcely be any doubt about the advisability of including such tests for hyperphoria as are mentioned in the paper under discussion. In this way a better understanding of the lesion can be obtained and consequently a more intelligent method of treatment instituted, even if this

can only be symptomatic.

Lawrence T. Post.

Lawrence T. Post

Offices held in the American Academy of Ophthalmology and Otolaryngology.

1928—Second Vice-President
1930—Associate Editor of the Transactions.
1931—Associate Editor of the Transactions.
1938—Member of the Council
1939—Member of the Council
1940—Member of the Council
1941—Member of the Council
1943—President Elect
1944—President
1945—Member of the Council (Past President)
1946—Member of the Council (Past President)
1947—Member of the Council (Past President, Senior Member)
1948—Member of the Council (Past President, Senior Member)
1953—Guest of Honor

Contributions to the Scientific Program of the Academy.

1923—Thermophore therapy of experimental sarcoma
1934—Social service in ophthalmology (with Miss Eleanor P. Brown)
1946—Visual training to improve sight in myopic patients (with Hildreth, Meinberg, Milder, and Sanders)
1951—Symposium: Retinal detachment—Introductory remarks
1953—Address by the Guest- of-Honor—The art of the practice of medicine as it applies to ophthalmology

The above record shows in bare outline the deep and continuous interest Larry had for the welfare and success of the Academy for 30 years. He loved the Academy and its members and only missed our meetings because of ill health. He served faithfully and well on a number of important standing committees, representing the Academy faithfully and with rare common sense. We shall all miss his guidance, sound advice, and his companionship at our meetings.

William L. Benedict.

My friendship with Larry Post began when I first entered The Johns Hopkins Medical School in 1910. He was one year ahead of me, but we were drawn together by our common interest in ophthalmology, inherited from our fathers. Throughout the ensuing 40-odd years we gradually saw more and more of each other. As our friendship grew and ripened, my admiration, respect, and affection for him grew apace. To his great distinction as a clinician, his outstanding literary ability, and his scientific attainments, he added the rare qualities of perfect honesty, humility, humor, good fellowship, a warm and generous heart, and a delightful personality. In his passing we have lost one of the great figures in our profession, and those who were privileged to share in his friendship have lost a companion who cannot be replaced. His memory will remain enshrined in our hearts.

Alan C. Woods.

With the passing of Larry Post, ophthalmology, and particularly American ophthalmology, has lost one of its outstanding figures, and I have lost a valued friend.

To have had the opportunity of learning to know Larry Post well was one of the rare privileges that come all too infrequently. I met Larry for the first time in 1922 when the A.M.A. met in St. Louis. From this meeting developed a friendship that persisted through the years. However, it was during the time that he was a guest at the Bohemian Grove for two weeks that I got to know him best, and his delightful sense of humor was never more apparent than in the friendly expanse of the giant Redwood forest.

He was a gentle soul who usually found

something good in everyone, but was willing to fight for what he thought was right. He was a trusted, true friend in whom one could confide, and whose counsel one knew would be wise.

It is the loss of such a friend that makes the world a little more lonely than it has been. He will be sorely missed.

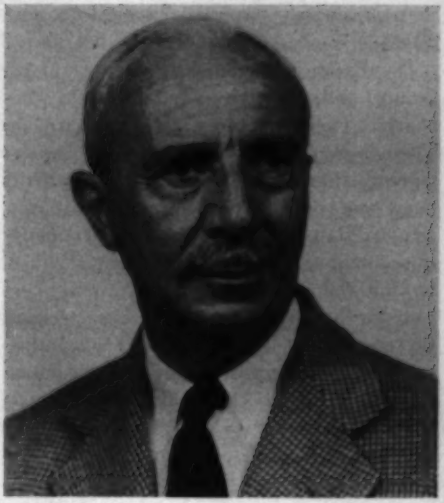
Frederick C. Cordes, M.D.

OTTO BARKAN
(1887-1958)

Otto Barkan, one of the outstanding ophthalmologists of the Pacific Coast and of this country, was born in San Francisco, April 5, 1887, and died in San Francisco on April 26, 1958, after an illness of 10 months. He was the son of Dr. Adolph Barkan, a native of Hungary, who was one of the original professors of eye, ear, nose, and throat on the faculty of the Stanford University School of Medicine. Otto Barkan's brother Hans and his son Thomas are also ophthalmologists in San Francisco.

Dr. Barkan was awarded his Bachelor of Arts Degree in physiology from Trinity College, Oxford, in 1909, and received his Doctor of Medicine Degree in 1914 in Munich, Germany. Later he served as house physician at St. Mary's Hospital, London, and became a member of the Royal College of Surgeons. His training in ophthalmology was obtained during five years of study at the Universities of Vienna and Munich.

In 1920, he was married to Margit Park of Stockholm, Sweden, and returned to practice in San Francisco where he became established in the practice of ophthalmology. During his 37 years of practice, Dr. Barkan made over 60 contributions to ophthalmologic literature which were published in American and foreign journals. He also found time to do research, particularly in glaucoma. His three most outstanding contributions in this field were, first of all, the popularization of gonioscopy. This led to the presentation of a new classification of glaucoma which was based on gonioscopic findings. One of his interests was in congenital and juvenile glaucoma, and his work in this field led to his third most important contribution, namely, the development of the modern surgical procedure of goniotomy. It was the recognition of his outstanding work in glaucoma that led to his receiving the Howe Medal from the American Medical Association, Section on Ophthalmology, in 1954.



Otto Barkan

In addition to his interest in ophthalmology, he was an ardent sportsman and, among other things, had been an oarsman on the Oxford University Crew. He was an outstanding skier and alpinist, and helped discover and name the famous California Sugar Bowl ski area in the early 1920's. He was also an ardent tennis player for many years.

Dr. Barkan was a member of the Stanford Medical School faculty, the American Ophthalmological Society, the British Opthalmological Society, French and Belgian Ophthalmological Societies, the American Academy of Ophthalmology and Otolaryngology, the Association for Research in Ophthalmology, Pacific Coast Oto-Ophthalmological Society, American Medical Association, California State Medical Association, and the

San Francisco Ophthalmological Round Table.

Dr. Barkan was tenderly devoted to his family, and is survived by his wife, Mrs. Margit Park Barkan, and his son, Dr. Thomas Barkan. He was a man of singular determination and industry and an unusually dexterous operator whose judgment was sound. His opinion and advice, particularly in the field of glaucoma, were greatly valued by his fellow practitioners. In him were combined the qualities and characteristics that go to make up an outstanding ophthalmologist and a good citizen in the community. To those who knew him well he was a loyal friend. With his passing the Pacific Coast has lost one of its most brilliant ophthalmologists.

Frederick C. Cordes.

CORRESPONDENCE

Clearing center for eye materials

Editor,
American Journal of Ophthalmology:

Several incidents have occurred recently which lead me to write this letter to reach a wide audience for an expression of opinion.

1. Urgent requests have been published in various ophthalmologic journals for freshly enucleated eyes with uveitis to be sent in a nonfixed condition.

2. Other investigators have been attempting to gather freshly excised corneal buttons from cases of corneal dystrophy to be studied by new staining techniques and histochemical methods.

3. Numerous ophthalmic pathology laboratories have been canvassed for an extensive study of iris tumors, requiring excised material, enucleated eyes, and follow-up studies.

A dichotomous purpose could be served by the establishment of an information center to receive requests and keep co-operating laboratories and clinical facilities informed regarding what is required and by whom. There would be two sections to such a registry:

1. A short-term clearing house to deal with fresh material for histochemical, electron microscopy, virus, and other biologic studies. Fresh tissue could be routed directly from the contributor to the requesting laboratory, or, if numerous demands occur for the same material, it could be sent to the registry and then parcelled to the various investigators. In order to avoid an extensive accumulation of tissue requiring storage and freezing facilities, a specified time limit would be set for the active investigation of any single problem.

2. A clinical registry where long-standing ocular diseases could be registered for periodic examination and evaluation by panels of clinicians in various sections of the country. Thus if once yearly all cases of long-standing iris and choroidal "benign melanomas" that were registered from the West Coast could be mobilized in San Francisco, where a panel of four or five clinicians interested in such problems could examine them and observe if changes occur, it is obvious that there would soon accumulate a body of exact knowledge on the behavior of such ocular lesions. The variety of ocular disturbances that lend themselves to such methods of study is considerable, and not enough cases accrue to any one physician or clinical center to make for definitive investigation.

The natural habitat for such a proposed clearing house is the Registry of Ophthalmic Pathology of the Armed Forces Institute of Pathology. It could be financed by a small grant from the Academy of Ophthalmology and Otolaryngology or by the National Institutes of Health, since a full-time clerical assistant and a part-time technician would be required.

With these events in mind I wish to quote a recent letter circularized by Dr. Averill A. Liebow, professor of pathology at Yale University, to the members of the Committee on Pathology of the National Research Council: "The pace of many investigations could

be greatly accelerated if access to wider sources of certain materials from man were made available to investigators. This is especially true when fresh tissues or body fluids are required. It is unfortunate that so much of this material is needlessly wasted by fixation in routine fashion."

There are numerous investigative problems of both an experimental and clinical nature that will fall into these categories, and that will occur to many readers of this letter. The undersigned would like an expression of opinion as to the need for such an information and clearing center, suggestions as to problems to be handled by such a center, ideas as to its mode of operation, its financing, and so forth.

(Signed) Benjamin Rones,
1302 18th Street, N.W.,
Washington 6, D.C.

BOOK REVIEWS

THE YEAR-BOOK OF OPHTHALMOLOGY (1957-58). Edited by Derrick Vail, M.D. Chicago, The Year-Book Publishers, 1958. 423 pages, 90 illustrations, subject and author indices. Price: $7.50.

After 57 years of publication, *The Year-Book of Eye, Ear, Nose, and Throat,* the first of the year-books, has fissioned and one of the twin babes makes its bow as the lusty *Year-Book of Ophthalmology,* becomingly outfitted in springtime green. The ophthalmologist is now offered more than twice the number of abstracts and editorial comments than appeared prior to the dichotomy. A novel feature is an annual review article by an outstanding authority in his particular field. In this issue, Leopold gives a perspective of recent advances in ocular therapy; next year Becker will present a similar survey of glaucoma.

For the most part the contents consist of ample abstracts of articles not readily available. However, THE AMERICAN JOURNAL OF OPHTHALMOLOGY and the *A.M.A. Archives of Ophthalmology* are each represented by 40 abstracts, and the *Transactions* of the Academy of Ophthalmology and Otolaryngology by 10 abstracts. As every qualified American ophthalmologist should be receiving these periodicals, much space could be saved for other material by markedly condensing such abstracts, though indicating fully their value by editorial comment. Even the best abstract is something like a translation of a poem; it is better whenever possible to read the original. From the *Klinische Monatsblätter für Augenheilkunde* come 35 abstracts, one of which is a very practical article by Mackenson, which gives a perfected technique for the treatment of congenital impatency of the nasolacrimal duct. Unfortunately, the all-important illustrations are omitted.

Among the myriad ophthalmologic ideas projected each year, some are lost and some refuse to take off, but it is surprising how many find their way into orbit—helped in some cases by a booster shot of Vail's comment. Vail's remarks—short, simple, strong, and sincere—impel attention. He often utilizes his personal repertory of remarkable case histories to make a point. In regard to amblyopia ex anopsia (p. 124), he tells of a mechanic, aged 65 years, whose left eye required enucleation. When six weeks old, his right eye had suffered a traumatic cataract from a penetrating pin. None the less, the corrected vision after cataract extraction was 20/25! Vail tolls the knell of the Ridley procedure. Indeed, Ridley himself has given it up for the anterior chamber acrylic lens, which is safer, simpler, and more efficient. Redmond Smith of London and Saubermann of Basle have independently concluded that most of the reaction to the plastic is due to the disinfectant. Saubermann hence rinses the plastic thoroughly, places it in distilled water for an hour, and rinses it again before use.

The *Year-Book of Ophthalmology* indicates to its readers the best contributions of the year. In most cases the values assigned by Vail are those that posterity will probably accept. James E. Lebensohn.

DOCUMENTA OPHTHALMOLOGICA: VOLUME XI. The Hague, W. Junk, 1957, 333 pages. Price: Not listed.

We have come to look forward to the annual appearance of this work on the advances in ophthalmology, as representative of most excellent contributions to our science. The board of editors and editorial committee, international in scope, contain the names of world-famous ophthalmologists.

With the exception of the first article in the present volume, that of F. Gafner on research in angioscotometry (in German) this entire number is devoted to reports given at a symposium on the aqueous, held in Munich in May, 1956. The various sections cover the cytology and bacteriology; protein chemistry and serology; electrochemistry; mode of action of Diamox; amino acids and enzymes; reducing substances, dynamics of aqueous flow; and aqueous and cerebrospinal fluid.

Unfortunately for many of us, the papers are written in German or French and, together with the extreme complexity of most of the subject matter, make it heavy going indeed. It is certain, however, that those who are interested in all or many of the phases of the subject of the aqueous, cannot do without this volume.

Derrick Vail.

METHODOLOGY OF THE STUDY OF AGEING. Edited by G. E. W. Wolstenholme and C. M. O'Connor. Boston, Little, Brown and Company, 1957. 202 pages, 47 illustrations, index. Price: $6.50.

Since 1954, the Ciba Foundation has sponsored conferences on the problems of ageing of which the third is reported in the present volume. The participants hail from 12 countries, including five from the United States. Clinicians, with the exception of pediatricians and obstetricians, are inevitably concerned with the disorders of the aged. According to Verzár, ageing begins when adaptability decreases. When the 15-year old boy shows a decreased accommodative capacity and the near-point is no longer 12 but 20 cm., something has started which decreases his adaptation to the variable conditions of life. The basis of ageing may perhaps be found in protein chemistry. With increasing age, collagen fibers show an increase in cross-linkages, a process that probably occurs in other filamentous molecules like insulin and nucleotides. Baló found that ageing cells tend to accumulate pigment substance which is notable especially in the intervertebral ganglionic cells of both animals and man. Tunbridge discussed the age changes in human dermal collagen. The possibility that these changes are brought about by environment or disease cannot be excluded. Kallmann emphasized genetic factors as revealed by his studies of identical and nonidentical twins, which indicate that the human life-span depends on gene-specific health and longevity potentials. Zilli reported that with ageing the intracellular water decreases though the extracellular water remains constant. Best concluded with the confident hope that biologic research will decrease the speed of ageing in the human subject.

James E. Lebensohn.

ACTAS QUINTO CONGRESO PANAMERICANO DE OFTALMOLOGIA, 1956: VOLUME 1. Chile, published by the Organizing Committee Chile, 1957. 698 pages, 46 illustrations, one color plate. Price: Not listed.

Those of us who attended the fifth Pan-American Congress of Ophthalmology will have pleasant, nostalgic memories in looking through these transactions. The scientific program, as brought out here, was very good indeed and the social activities, also described, reflected the kindness and generous hospitality of our gracious hosts. Those who, unfortunately, did not attend this congress can readily see what they missed, but should still be able to profit from reading this book, for it is full of excellent material, for the

most part of valuable clinical expression, some of it not to be found elsewhere. The names of all contributors are well known, especially in the western hemisphere, for their authoritative experimental and clinical work.

The papers are printed in the language of their authors, but each paper is summarized in the other two official languages, English and Spanish, and in Portugese, so that anyone reading this production can at least get the gist of the subjects under discussion.

Our delightful colleagues of Chile are to be congratulated and thanked for doing this superb job of collecting, editing, and publishing the transactions. The binding is excellent, the printing is good and very clear; the proof reading, which must have been a most difficult task, was exceedingly well done and the illustrations are reasonably satisfactory. (In no sense of harping criticism, for I am aware of the technical difficulties involved, I should like to ask the question, "Why are medical illustrations in the Latin-American literature almost universally relatively poor in quality and reproduction?" I don't think it is always due to the quality of the paper used, for in this instance it is quite good, and yet many of the illustrations lack the sharp detail to which most of us are accustomed in our scientific literature. Perhaps, the various medical societies and universities in Latin America ought to look into this matter.)

Only those of us who have had the experience of the hardships, expense, and difficulties of bringing out the transactions of an international organization can really appreciate the extraordinary task our Chilean colleagues have faced and the magnificent way they have encompassed it. I am indeed filled with admiration, and grateful for this production.

Derrick Vail.

FUN COMES FIRST FOR BLIND SLOW-LEARNERS. By Mildred Blake Huffman, M.A. Springfield, Illinois, Charles C Thomas, 1957. 157 pages, 18 illustrations, bibliography, index. Price: $5.00.

Mrs. Huffman, a teacher in the residential California School for the Blind at Berkeley, describes in detail the educational principles that she uses successfully in teaching slow-learning blind children. Experiments with experiences interesting to children are related together with case-report demonstrations of the effect of such experiences upon the educational, social, and emotional growth of these children. Such multiple handicapped children pose a special problem and it is the teacher's responsibility to accept the challenge. Many states take care of the education of blind children provided they have a sound mind, or for the education of the mentally retarded provided they have no sensory handicap. Much of the material in this book is valuable also in the education of such less handicapped children.

James E. Lebensohn.

ABSTRACT DEPARTMENT

EDITED BY DR. F. HERBERT HAESSLER

Abstracts are classified under the divisions listed below. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. Anatomy, embryology, and comparative ophthalmology
2. General pathology, bacteriology, immunology
3. Vegetative physiology, biochemistry, pharmacology, toxicology
4. Physiologic optics, refraction, color vision
5. Diagnosis and therapy
6. Ocular motility
7. Conjunctiva, cornea, sclera
8. Uvea, sympathetic disease, aqueous
9. Glaucoma and ocular tension
10. Crystalline lens
11. Retina and vitreous
12. Optic nerve and chiasm
13. Neuro-ophthalmology
14. Eyeball, orbit, sinuses
15. Eyelids, lacrimal apparatus
16. Tumors
17. Injuries
18. Systemic disease and parasites
19. Congenital deformities, heredity
20. Hygiene, sociology, education, and history

10

CRYSTALLINE LENS

Brunsting, L. A., Reed, W. B. and Bair, H. L. **Additional report on the occurrence of cataracts with atopic dermatitis.** A.M.A. Arch. Derm. & Syphil. **76**:779, Dec., 1957.

In 1955, 1,158 patients with atopic dermatitis were reported by the same authors; 136 were found to have lens opacities and 57 of these were asymptomatic. This report is concerned with their subsequent history; 36 replied to questionnaires and in only three had the lens changes progressed far enough for the patient to report difficulty in seeing. These patients also had continuing trouble with their skin and in all three cataract surgery was necessary. (1 reference)

Edward U. Murphy.

Callahan, A. and Klien, B. A. **Thermal detachment of the anterior lamella of the anterior lens capsule.** A.M.A. Arch. **59**: 73-80, Jan., 1958.

The death of a patient with true exfoliation of the lens capsule due to thermal injury presented an opportunitty for didect correlation of the clinical and histologic findings in this condition. The findings in an eye with pseudoexfoliation are briefly contrasted. (8 figures, 9 references) Edwward J. Swets.

Dolcet-Buxeres, L. **Galactosemic cataract.** Arch. Soc. oftal. hispano-am. **18**:66-72, Jan., 1958.

This is a brief history of the first case of galactosemic cataract reported in Spain. The infant, 26 days of age, developed turbidity of the media and lenticular opacities, with other symptoms of galactosemia. The lenticular opacities cleared 40 days after arresting lactation. The reversability of early lenticular changes makes an early diagnosis important. (1 figure, 20 references) Ray K. Daily.

McPherson, S. D. and Fisher, G. W. **Results of cataract extraction following filtering operations for glaucoma.** South. M.J. **51**:99-102, Jan., 1958.

The results of cataract extraction following functioning filtering operations in 24 eyes are reviewed. In all cases a keratome incision was made superiorly in the clear cornea some two milimeters below the filtering bleb and the wound was

closed with three preplaced sutures. Fourteen patients developed visual acuity postoperatively of 20/200 or better, and only three had a reduced visual acuity which was attributable to the corneal scarring which resulted from the incision. The average postoperative astigmatism was one and one half diopters. The operative and postoperative complications with this method are described and it is felt that they are in keeping with those observed following routine extractions. In only one patient was subsequent glaucoma surgery necessary. (1 figure, 4 tables, 6 references)

William S. Hagler.

Neuberg, H. W., Griscom, J. H. and Burns, R. P. **Acute development of diabetic cataracts and their reversal.** Diabetes 7:21-26 Jan.-Feb., 1958.

A 52-year-old patient with diabetes mellitus is described in whom bilateral cataracts developed within 40 hours after the initiation of insulin therapy and four hours after a mild transient episode of hypoglycemia. These cataracts were of the classical diabetic type in that they began as lamellar stellate clefts and advanced to total opacification. The cataracts showed complete clearing within seven weeks on continued insulin therapy as did the unexplained central scotomata which developed at the same time. The patient also had exophthalmos, chemosis, parotid swelling, and exocrine pancreatic insufficiency; these lesions could not be satisfactorially explained, but were not believed to be related to the development of cataracts. Six other similar cases in the literature are reviewed, and the possible mechanisms for the development of acute diabetic cataract are discussed. (5 figures, 2 tables, 29 references)

William S. Hagler.

Salleras, A. **Our technique of cataract extraction (1957).** Arq. brasil. de oftal. 20:255-262, 1957.

The author has performed more than 1,500 cataract extractions in the past ten years, and has perfected his technique of using the erisophake. This report describes his current preference, as employed in approximately 500 cases.

The patient is premedicated with phenergan, luminal, ampliactil (a derivative of chloropromazine), demerol, and diparcol (a drug used in treating Parkinson's syndrome). This medication makes it unnecessary to make a retrobulbar injection for anesthesia. Akinesia is obtained by infiltration with xylocain along the superior and inferior orbital margins.

The corneal incision is made in clear cornea with a Graefe knife. No conjunctival flap is made. A silk suture is placed at 11- and 1-o'clock, with the central portions united to one another. A small peripheral iridotomy is essential to avoid postoperative complications. The lens is delivered in capsule by a combination of traction with the erisophake and pressure by means of a loop. The suction cup is introduced behind the iris below the inferior pupillary margin. It is emphasized that in this technique the extraction is done by means of the loop, with the erisophake acting as a guide to the lens delivery. After delivery, miosis is obtained by instilling dilute acetylcholine directly into the anterior chamber. The sutures are tied after severing that portion which joined the two that were previously placed, and additional sutures are placed. The iris is replaced if necessary and the chamber is reformed. This latter procedure is of great importance in evaluating the closure of the wound and in avoiding late complications. A monocular dressing is employed and the patient is confined to bed for 24 hours. Early ambulation is recommended.

James W. Brennan.

von Sallmann, Ludwig. **The lens epithelium in the pathogenesis of cataract.**

Tr. Am. Acad. Ophth. 61:7-19, Jan.-Feb., 1957.

The author analyzed about 1,000 lenses in his studies. In one series of experiments the effect of a standard dose of an agent injurious to the lens on seven species of laboratory animal were compared. In the other series, varying sequelae produced by five cataractogenic agents in one species were contrasted. In lens opacities produced by ionizing radiations and radiomimetic drugs the cell nucleus is injured in the germinative zone first, then follows a series of pathologic changes which are irreversible and progressive. In galactose, alloxan and tryptophane deficiency cataracts the epithelium in the germinative zone is little involved, with the exception of its mitotic activity. New fibers are formed upon the withdrawal of the injurious factors. (17 figures, 5 references) Theodore M. Shapira.

von Sallmann, L., Caravaggio, L., Grimes, P. and Collins, E. M. **Morphological study on alloxan-induced cataract.** A.M.A. Arch. Ophth. 59:55-67, Jan., 1958.

The morphology of incipient alloxan-induced cataract was studied systematically under controlled conditions. The changes produced in the lens of the rat were studied histologically. Biomicroscopically visible signs of lens damage as a result of alloxan are analyzed. (15 figures, 2 tables, 25 references) Edward J. Swets.

Seedorff, H. H. **A study on the etiology and operative course in a series of 200 cataract patients aged 20-60 years.** Acta ophth. 35:485-490, 1957.

Parathyroprivia is a more common cause of cataract in the young than is generally realized. The operative risk is higher in young cataract patients, a fact which is difficult to explain, but probably has to do with the etiologic factor. (3 tables, 8 references) John J. Stern.

Zabriskie, J. and Reisman, M. **Marchesani syndrome.** J. Pediat. 52:158-169, Feb., 1958.

The Marchesani syndrome is characterized by spherophakia associated with myopia and glaucoma in a patient of short stature and brachydactyly. It shares the spherophakia with Marfan's syndrome, the other manifestations of which are in striking contrast to those of Marchesani syndrome. The relationship between the two syndromes is discussed. (3 figures, 3 tables, 15 references) F. H. Haessler.

11
RETINA AND VITREOUS

Anjou, I. and Cederquist, E. **Roentgen therapy of Eales' disease.** Acta ophth. 35:441-450, 1957.

Twenty-one eyes with Eales' disease received Roentgen therapy with relatively large doses, according to the technique of Guyton and Reese. After one to seven years only two eyes showed improvement possibly ascribable to this therapy. In conformity with the original proponents of the method, its use has been discontinued. (1 table, 4 references) John J. Stern.

Arruga, H. **Recent modifications in the surgery of retinal detachment.** Arch. Soc. oftal. hispano-am. 18:55-65, Jan., 1958.

The Custodis and Schepens operations are described and a new procedure for approximating the choroid to the retina is described and illustrated. It consists of passing a nylon or supramid suture on a Grieshaber scleral needle through the sclera at the equator and parallel to it and tightening it after the subretinal fluid has been evacuated. The suture is passed under the muscles, so that they need not be severed. The region of the tear is cauterized by diathermy, a scleral resection is done if indicated, and air is injected into the vitreous if the globe is very soft. Eleven eyes with old lesions, large tears, and an unfavorable prognosis operated

upon in this manner resulted in improved visual acuity to 0.4 in one case, 0.1 in three cases and 0.05 in one case; in six cases the operation was unsuccessful. (12 figures) Ray K. Daily.

Boggess, Julian E. **Sickle-cell retinopathy.** Mississippi Doctor **35**:178-180, Jan. 1958.

Sickle-cell disease need not be associated with an anemia to produce other abnormalities. Sickle-cell disease causes obstructive vascular phenomena. There is evidence that the disease may occur in pure Caucasians. Sickle-cell preparations should be made in cases of retinal hemorrhage of obscure etiology. (7 references) Irwin E. Gaynon.

Bosso, Giancarlo. **Acute leukemic retinopathy with microscopic study.** Rassegna ital. d'ottal. **26**:376-388, Sept.-Oct., 1957.

Changes in the fundus are the most common ocular finding in leukemia, but lesions of the adnexa, orbit, and uvea are also seen. Retinal hemorrhages may be of pinpoint size or striate about the margin of the papilla and may be deep or preretinal. The patient described died after a relatively short time. Microscopic study of the posterior half of the globe and the optic nerve revealed an interstitial optic neuritis with a central hemorrhage, an extravasation of leukemic cells surrounding a mass of red cells. (3 figures, 25 references) Eugene M. Blake.

Cook, C. A. G. **Role of fat emboli in diabetic retinopathy.** Brit. J. Ophth. **41**: 741-745, Dec., 1957.

Much has been written recently about the possible association between fat emboli and the pathogenesis of diabetic retinopathy. Bi-weekly injections were given to 18 cats over a period of one to eight weeks. Four different kinds of fats were used. In both the retinal and the renal vessels considerable evidence of the fatty emboli was found within the capillaries and the perivascular areas. However, no degenerative changes were found and the findings do not support the hypothesis that diabetic lesions can be produced by fat embolism alone. (4 figures, 7 references) Morris Kaplan.

Crome, L. **Retrolental fibroplasia and its association with neural and somatic disease.** J. Path. & Bact. **75**:163-182, Jan., 1958.

The author describes two mentally defective children who had retrolental fibroplasia and came to autopsy. The literature on the association of retrolental fibroplasia with other neurologic and somatic abnormalities is reviewed. The author points out that retrolental fibroplasia is not always an ocular lesion primarily but may be a local manifestation of a general disorder. F. H. Haessler.

François, Jules. **The differential diagnosis of tapetoretinal degenerations.** A.M.A. Arch. Ophth. **59**:88-120, Jan., 1958.

The differential diagnosis of peripheral and central tapetoretinal degeneration, congenital functional anomalies of the retina, and congenital and acquired chorioretinitis is discussed, and some particularly difficult cases are described. (26 figures) Edward J. Swets.

Frenkel, J. K. and Jacobs, L. **Ocular toxoplasmosis.** A.M.A. Arch. Ophth. **59**: 260-279, Feb., 1958.

A complete report of the present status of ocular toxoplasmosis is given. (1 figure, 2 tables, 66 references) G. S. Tyner.

Hummelt, Klaus. **Histologic findings after scleral folding.** Klin. Monatsbl. f. Augenh. **132**:18-25, 1958.

A 78-year-old woman died two weeks after an operation which consisted of an infolding of the sclera without excision.

The retina was attached to the fold, but otherwise detached. In a second patient the eye had to be enucleated six weeks after the operation because of an intraocular infection. The scleral fold was still present, but the retina was totally detached. (7 figures, 13 references)

Frederick C. Blodi.

Lemoine, Albert N., Jr. **Differential diagnosis of macular lesions.** Iowa St. Med. Soc. J. **48**:238-240, May, 1958.

The author describes the important lesions which occur in the macular region —choroidal rupture, tumors, chorioretinitis, disciform degeneration of the macula, senile macular degeneration, cystic macular degeneration, macular edema, macular hemorrhage, hereditary macular lesions, and solar retinitis—and discusses their diagnosis. Irwin E. Gaynon.

Lijo Pavía, J. **Factors in the arteriolar occlusion of the retina.** Rev. oto-neuro-oftal. Sudam. **32**:118-120, Oct.-Dec., 1957.

The author points out that the occlusion of the retinal arterioles usually occurs slowly in arteriosclerosis and diabetes, but that there are times when the slow process suddenly changes into a rapid one of extreme gravity. Some of the factors which may give the process a grave prognosis are the so-called ischemic papilledema, as found in temporal arteritis and in cases of arteriolar occlusion at the level of the optic disc, embolism of the central artery, generalized arteriolar spasms, venous thrombosis, and finally hypotension in the central retinal artery. Whenever this last factor, which has not received as much attention as it deserves, occurs, it is of very grave significance, as an occlusion may occur at any time. (13 references) Walter Mayer.

Lipsius, Edward I. **Senile macular degeneration: what is its significance?** Am. Geriat. Soc. **5**:798-799, Sept., 1957.

Uncomplicated senile macular degeneration is usually a self limited disease, the peripheral vision is usually not disturbed. The patient should be given assurance and although the treatment is empirical, a negative approach to therapy is unwise. (1 reference) Irwin E. Gaynon.

Manschot, W. A. **Persistent hyperplastic primary vitreous.** A.M.A. Arch. Ophth. **59**:188-203, Feb., 1958.

In addition to the usual locations of this tissue, the author describes it also as present in a new site, not previously described, namely, on the inner surface of the retina. Fourteen cases are described to point up this dissertation. (30 figures, 14 references) G. S. Tyner.

McIntosh Nicol, A. A. **Lindau's disease in five generations.** Ann. Human Genet. **22**:7-11, Oct., 1957.

Lindau's disease is discussed briefly and a pedigree is given, embracing five generations. In this series there were four definite cases of cerebellar cysts, including two in which the presence of hemangioblastoma was confirmed, 11 cases of suspected intracranial tumor, and three suspected pancreatic cyst. (1 figure)

Irwin E. Gaynon.

Okamune, S. and Yamamoto, T. **Ocular involvement of pheochromocytoma and its relation to albuminuric retinitis.** Acta Soc. Ophth. Japan **61**:1769-1776, Oct., 1957.

A 43-year-old man, who had a fundus finding of an albuminuric retinitis, was found to have a renal tumor which was a pheochromocytoma. After removal of the tumor the ocular symptoms disappeared. (6 figures, 5 tables, 31 references)

Yukihiko Mitsui.

Oksala, A. and Lehtinen, A. **Diagnostics of detachment of the retina by means of ultrasound.** Acta ophth. **35**:461-467, 1957.

Ultrasound was used to diagnose bilateral detachment of the retina. In the right eye observations obtained by ultrasound equipment and by ophthalmoscopy were in agreement. In the left eye, which had a cataract, detachment and its position were diagnosed by the echoes emitted by the detached retina, and the possibility of tumors could be excluded. 5 figures, 6 references) John J. Stern.

Rifkin, H., Solomon, S. and Lieberman, S. **Role of the adrenal cortex in diabetic retinopathy and nephropathy.** Diabetes 7:9-14, Jan.-Feb., 1958.

The plasma 17-hydroxycorticosteroids, the urinary excretion of total 17-hydroxycorticosteroids and the identifiable and individual urinary 17-ketosteroids, as well as the response of these substances to exogenously administered ACTH were studied in a fairly large group of diabetic patients, with and without retinopathy and nephropathy. The results of this investigation indicate that there is no evidence of adrenal cortical hyperfunction in patients with uncomplicated diabetes or in diabetics with retinopathy or nephropathy or both. (7 figures, 22 references) William S. Hagler.

Ullerich, K. and Krause, G. **Histologic examinations for the pathogenesis of idiopathic retinal detachment.** Klin. Monatsbl. f. Augenh. 132:1-17, 1958.

The authors report a case of marked retino-vitreal adhesions incidentally found in the enucleated eye of a 53-year-old man with secondary glaucoma after central vein occlusion. This adhesion in the upper segment was connected with a posterior vitreous detachment and caused a destruction of the inner and middle retinal layers in that area. (13 figures, 62 references) Frederick C. Blodi.

Valcarce-Avello, J. **Advances in the surgery of retinal detachment.** Arch. Soc. oftal. hispano-am. 17:1209-1221, Oct.-Nov., 1957.

The author divides retinal detachments into three groups: those with retino-vitreous adhesions and fixed folds; those with large tears, retinal lesions and aphakia; and those with small tears. Schepens' operation is described in detail, and the author advocates his own modification of Schepens' operation. This consists of a lamellar sceral resection with inclusion of the resected piece of sclera instead of a polyethylene tube. Ten brief case histories are reported. His results lead him to conclude that lamellar scleral resection with inclusion of the resected lamina improves the results in the second type of retinal detachment. (7 figures, 4 references) Ray K. Daily.

12

OPTIC NERVE AND CHIASM

Boles, W. M., Naugle, T. C. and Samson, C. L. M. **Glioma of the optic nerve.** A.M.A. Arch. Ophth. 59:229-231, Feb., 1958.

The extreme rarity of the condition is mentioned, and a case in a six-year-old white girl is reported. (3 figures, 6 references) G. S. Tyner.

Buxeda, Roberto. **Chiasmal optic neuritis.** A.M.A. Arch. Ophth. 59:29-33, Jan., 1958.

Chiasmal optic neuritis is a variant of retrobulbar neuritis which is seldom recognized. The fluctuating nature of the visual field defect is shown in the case which is presented, and a plea is made for ophthalmologists to search for such lesions. (4 figures, 5 references) Edward J. Swets.

Imachi, J. **Etiology of chronic retrobulbar optic neuritis and the relation between the disturbance of spinal fluid circulation and the function of the optic**

nerve. Acta Soc. Ophth. Japan **61**:2039-2050, Oct., 1957.

Clinical experiences and the results of animal experiments are described in detail. Imachi concludes that a deficiency in vitamin B_1 and vitamin A accelerates the manifestation of this condition regardless of its actual etiology. He also thinks that an optochiasmatic arachnoiditis can cause a secondary neuritis by causing a disturbance of spinal fluid circulation. (23 figures, 9 tables) Yukihiko Mitsui.

Jain, N. S. **Optic nerve tumor treated by Krönlein's lateral orbitotomy.** Brit. J. Ophth. **41**:767-769, Dec., 1957.

A 12-year-old boy was seen with severe unilateral proptosis and total loss of vision in the eye. The diagnosis of glioma of the optic nerve was made and surgery of the usual Krönlein orbitotomy was performed. A large tumor of the optic nerve was removed. The diagnosis of glioma was confirmed and cosmetically the end result was satisfactory. (9 figures)

Morris Kaplan.

Kwitten, J. and Barest, D. **The neuropathology of hereditary optic atrophy (Leber's disease): the first complete anatomic study.** Am. J. Path. **34**:185-207, Jan.-Feb., 1958.

The authors report the first complete pathologic examination of the central nervous system in a case of hereditary optic atrophy (Leber's disease). In the retina there was marked atrophy of the ganglion cell layer with some atrophy of the inner nuclear layer. The optic nerve showed extensive atrophy without any inflammatory infiltration. The optic nerves, tracts, and chiasm showed a severe degree of symmetric destruction of the myelin sheaths and axis cylinders in the central segment containing the macular fibers. Both geniculate bodies showed marked cellular atrophy. The calcarine cortices were normal as was the pituitary gland.

This study failed to find any evidence that Leber's disease results from a pituitary disorder, chronic arachnoiditis, or toxic retrobulbar neuritis as had been previously suggested. The findings suggest that the disease results from a primary neuronal degeneration of the retina and optic nerve, with secondary degenerative changes of the remaining optic system except for the calcarine cortex. (17 figures, 20 references)

W. S. Hagler.

Leggat, P. O. **Diffuse pulmonary emphysema and papilloedema.** Lancet **1**:672-673, March 29, 1958.

A case of heart failure is reported. Difficulty may arise in distinguishing from cerebral tumor because papilledema may persist after heart failure and hyperemia have been relieved. (20 references)

Irwin E. Gaynon.

Montauffier, de la Bernardie and Camo. **Lesions of the optic nerve in closed injuries of the skull.** Ann. d'ocul. **191**:32-61, Jan., 1958.

The authors report eight cases of optic nerve injury following trauma to the head. All were so-called closed injuries although the eighth patient had a rhinorrhea and radiologic evidence of a fracture extending into the orbit. In almost all the loss of vision was immediate and treatment consisted of retrobulbar injections of vasodilators. Since these injections promoted a return of vision, the authors feel that the injury in these cases is probably vascular. The site is either the central retinal artery or the perforating nutrient branches of the ophthalmic artery. Most of the patients improved gradually and reached a plateau with some permanent loss of vision, therefore the authors make a plea for nonsurgical treatment in cases of immediate blindness or where there is any improve-

ment in the visual fields. They feel that surgery should be reserved for cases with obvious chiasmal lesions. (10 figures, 17 references) David Shoch.

Oribe, M. F. and Zimman, J. **Glioma of the optic nerve.** Arch. oftal. Buenos Aires **32**:249-258, Sept., 1957.

While for certain authors (Hudson, 1912; Lundberg, 1934; Davis, 1940) glioma of the optic nerve is of relatively common occurrence—in so far as the notion of frequency goes in the matter of optic nerve tumors—others regard this growth as of considerable rarity (Collins and Marshall, 1900); in any event, only some 400-odd well-authenticated cases are on record.

Although as a rule unilateral, the condition has occasionally been observed to affect both optic nerves. Poor vision is usually an early symptom and optic atrophy follows within a short period; most instances are in children. Meningioma of the optic nerve, on the other hand, appears ordinarily in the fourth decade of life and causes a reduction of vision only as a late complication.

Prognosis is good, provided that complete excision is done before involvement of the chiasm takes place. The pathology of the condition is still far from settled: according to some, these tumors are predominantly astrocytomas, others, in turn, regard them as oligodendrogliomas, and a few as spongioblastomas, whereas there are still others who prefer to see in them the result of glial hyperplasia.

Six new cases are reported, in three of which von Recklinghausen's disease was simultaneously present. In all the diagnosis was established through the study of the specimens removed at operation. (1 diagram, 8 figures, 6 references)

A. Urrets-Zavalia, Jr.

Paiva, Clovis. **Primary tumor of the optic nerve, associated with von Recklinghausen's disease.** Arq. brasil. de oftal. **20**: 243-254, 1957.

A seven-year-old child had unilateral exophthalmos for two years. The affected eye was blind, with optic atrophy and radiographic evidence of enlargement of the optic foramen. The presence of "café au lait" spots made a diagnosis of von Recklinghausen's disease most probable. In an attempt to remove a tumor which involved the optic nerve the cranial cavity was opened. Since the tumor had extended to the entire nerve and chiasm, it was deemed impractical to try to remove the entire tumor and only the intraorbital portion was excised. Microscopic examination revealed characteristics of meningioma of the mixed type. The tumor is quite rare, has a low index of malignancy and spreads by direct extension within the cranial cavity without producing metastases. (10 figures, 9 references)

James W. Brennan.

13

NEURO-OPHTHALMOLOGY

Madow, Leo. **Cortical blindness.** J. Neuropath. **17**:324-332, April, 1958.

Blindness which results from destruction of the occipital lobes is rare and pathologically confirmed instances have been recorded only occasionally. Madow reports the case of a coal miner, aged 45 years, who suddenly went completely blind while unconscious and did not recover his vision. The pupils did not react to light and the eyes were normal. Autopsy revealed arteriosclerosis of the cerebral vessels and softening of both occipital lobes with destruction of both white and gray matter. (2 figures, 15 references)

Irwin E. Gaynon.

Mooney, Alan. **Some neuro-ophthalmological problems.** Brit. J. Ophth. **42**:129-256, March, 1958.

The author points out the ophthal-

mologist's importance in a neurosurgical team. Details of clinical cases of a variety of neurologic problems are described, such as congenital disc malformations, hypertensive discs, papilledema and tuberculous meningitis, optic neuritis, refractive errors, retrobulbar neuritis, toxic amblyopia, pale discs in tuberculous meningitis and other misleading signs. (36 figures)

Morris Kaplan.

Rubin, William. **Treatment of first-division tic douloureux by peripheral neurectomy.** A.M.A. Arch. Ophth. 59:243-246, Feb., 1958.

Two cases of first-division tic douloureux were successfully treated by peripheral neurectomy of the supraorbital, supratrochlear, infratrochlear, and anterior ethmoidal nerves. (4 figures, 6 references)

G. S. Tyner.

Rucker, C. Wilbur. **The concept of a semidecussation of the optic nerves.** A.M.A. Arch. Ophth. 59:159-171, Feb., 1958.

This paper gives the history of the development of the idea of a semidecussation of the optic nerves as promulgated by Isaac Newton (1704), Vater and Heinicke (1723), and Wollaston (1824). The description of Newton's life and ideas is most interesting. (10 figures, 50 references)

G. S. Tyner.

Symonds, C. and Mackenzie, I. **Bilateral loss of vision from cerebral infarction.** Brain 80:415-455, Dec., 1957.

A review is presented of 29 cases from the literature in which loss of vision in both halves of the visual fields was associated with the postmortem observation of bilateral occipital lobe infarction. The clinical data of 20 cases from the literature in which comparable symptoms were observed without postmortem examination are also summarized.

Nine further observations of the syndrome are presented, four with postmortem confirmation, and the material thus derived from 58 cases is discussed.

The loss of vision may be sudden or gradual. Both half-fields may be affected at the same time or in succession. The common mode of onset is a sudden loss of both half-fields.

The most frequent prodromal symptoms are attacks of vertigo, and transient episodes of visual impairment.

Permanent blindness occurs in a quarter of the cases.

The pattern of the visual fields when there is partial sparing or recovery of vision indicates that the area most often preserved corresponds with, or lies within, a circle extending to about 10 degrees from the fixation points. In the more peripheral parts of the visual fields the sectors adjacent to the vertical meridian are not infrequently spared when there is loss of the remainder. Selective loss of central vision is a rare, but well authenticated, occurrence.

Psychological disorder, including spatial disorientation, visual agnosia, denial of blindness, visual hallucinations and other symptoms, is an inconstant, but sometimes conspicuous, feature of the syndrome.

The anatomical basis of the visual field defects is discussed, and the arterial blood supply to the visual cortex and optic radiations is considered in relation to the clinical and pathological data.

The pathogenesis of the syndrome is discussed with especial reference to the occurrence of simultaneous loss of vision in both halves of the visual fields, and the postmortem findings, in a significant proportion of the cases in which full pathological data are available, of thrombosis in the basilar or vertebral arteries. The conclusion is drawn that the most frequent cause of bilateral occipital lobe infarction is embolism of the calcarine arteries. The emboli may result from val-

vular disease of the heart, auricular fibrillation or coronary thrombosis, but are more often derived from thrombus formed within the basilar or vertebral arteries as the result of atherosclerosis. (16 figures, 66 references) Authors' summary.

Thiel, H.-L. **Ocular complications of intracranial aneurysms.** Arch. f. Ophth. **159**:569-581, 1958.

The author discusses the ocular manifestation of intracranial aneurysms and arteriovenous aneurysms which occurred in seven patients. Two groups of symptoms are distinguishable: 1. the triad of pulsating exophthalmos, congestion of the protruding eye and intracranial noises synchronous with the arterial pulsations, and 2. various ocular signs which do not immediatly suggest a diagnosis. The second group makes it seem advisable to auscultate the head and take arteriograms routinely in all patients with equivocal neuroöphthalmic syndromes. (11 figures, 27 references) F. H. Haessler.

Uihlein, Alfred. **Acute visual failure as a neurosurgical emergency.** Brit. J. Ophth. **42**:157-172, March, 1958.

In 49.7 percent of 310 patients seen at the Mayo Clinic for unilateral visual loss, the loss was due to lesions of the eyeball and to glaucoma. A lesion of the nervous pathways was the cause of loss in 34, 8 percent of the cases and most of the lesions were pituitary tumor or meningioma. In the order of frequency, these neurosurgical conditions may be listed as follows: 1. pituitary tumor, 2. tumor of the optic nerve or chiasm, 3. supraclinoid aneurysms, 4. parasellar lesions, 5. carotid arterial thrombosis, 6. third ventricle hydrocephalus, 7. chiasmal arachnoiditis, 8. fracture of anterior cranial fossa, 9. basofrontal tumor of the skull, and 10. pseudotumor cerebri.

Five cases are reported to emphasize the need for complete and accurate medical, neurologic, and ophthalmologic investigation. (18 figures, 1 table, 9 references) Morris Kaplan.

14
EYEBALL, ORBIT, SINUSES

Constantinovits, M. and Guszich, A. **Intermittent exophthalmos (cured by operation).** Szemeszet **94**:149-155, 1957.

The various patterns of exophthalmos cannot be readily distinguished in all cases. No doubt surgery is the most effective treatment in proper cases, but because its occasional complications interfere with visual acuity, operation should be preceded by careful deliberation. It is the last means of therapy, to be applied only after the failure of conservative procedures. The operator should be familiar with the surgery of borderline areas because postoperative complications may lead to greater disorders than those associated with the untreated lesion.

The authors describe a patient for whose intermittent exophthalmos, due to a retrobulbar varix, a Krönlein's operation had been done eight years previously. No complication arose from the operation, the sight did not deteriorate, and the patient has no complaints. The paresis of the abducens nerve had been present before the operation and does not impair the patient's efficiency at work. Gyula Lugossy.

Fryd, C. H. and Hauer, J. **Observations in hyperthyroidism and exophthalmos.** Acta Med. Orient. **16**:160-167, July-Aug., 1957.

A study of 100 cases of hyperthyroidism in six years suggests that there is no fundamental difference between ordinary Graves' disease and that associated with malignant exophthalmos even when no hypermetabolism is evident. There is, however, an essential difference between the two forms of toxic goiter, the nodular

type (Plummer's disease) and the diffuse type (Graves' disease).

F. H. Haessler.

Hager, G. **Phleboliths in the orbit.** Arch. f. Ophth. **159**:662-666, 1958.

Phleboliths are rarely encountered in the orbit; they originate in fibrin deposits which become concentrically organized and calcified. To the very few noted in the literature the author adds a case which occurred in a woman, now 55 years of age, with 10 phleboliths in her left orbit. She had had intermittent exopthalmos on the left side 30 years ago which was ascribed to intraorbital varices. Typical roentgenograms and histologic preparations of orbital tissue obtained by biopsy are exhibited. (5 figures, 7 references)

F. H. Haessler.

Jensen, Vagn J. **Sarcoidosis of the orbit.** Acta ophth. **35**:416-419, 1957.

Two cases are reported which illustrate the difficulty of making the diagnosis (10 references) John J. Stern.

Krayenbühl, H. **Diagnostic value of orbital angiography.** Brit. J. Ophth. **42**:180-190, March, 1958.

With the use of a new contrast medium, Urografin (Schering) the ophthalmic artery, most of its branches, and the choroidal plexus can be visualized in a great majority of patients. In this study 117 patients with unilateral exophthalmos were examined by angiography and in nine of these the cause was detected by this method. In all of them the vascularization of the lesion itself could be demonstrated. (13 figures, 4 references)

Morris Kaplan.

Langmaid, C. and Daws, A. **Pulsating exophthalmos in von Recklinghausen's disease.** J. Neurol., Neurosurg & Psychiat. **21**:42-46, Feb., 1958.

Defects in the wall of the orbit which are well defined on X-ray examination are relatively common in this disease. While the extent of bony abnormality may vary from case to case, characteristically there is an absence of bony detail in the posterior part of the orbit due to a partial absence of the orbital plate of the frontal bone, and a similar lack of development of the greater and lesser wings of the sphenoid bone. The body of the sphenoid may also be involved. The affected orbit is usually larger than normal. The defect in the wall of the orbit permits a direct transmission of the pulsations from the brain to the orbit of the eye. (8 figures, 14 references) Irwin E. Gaynon.

Lyle, D. J. **Treatment of exophthalmos as viewed by the ophthalmologist.** Roy. Coll. Surg. Ann. **21**:203-216, Oct., 1957.

The various causes of exophthalmos are classified in six categories: congenital, inflammatory, vascular, traumatic, metabolic, and neoplastic. Each of these is discussed with special emphasis on the treatment which is indicated. It is stated that no orbit should be explored, either for biopsy or for excision, unless a palpable mass is present. However, if the exophthalmos is progressing, the vision is jeopardized, or the muscles are becoming paretic or paralytic, transconjunctival palpation through a temporal canthotomy is indicated. The various surgical approaches to the orbit are described and illustrated. (5 figures, 10 references)

William S. Hagler.

Scott, G. I. **Ocular aspects of endocrine exophthalmos.** Brit. J. Ophth. **42**:173-179, March, 1958.

The term endocrine exophthalmos includes thyrotoxic exophthalmos and the condition variously called malignant exophthalmos, exophthalmic ophthalmoplegia and thyrotropic exophthalmos. The principal diagnostic signs of the two conditions may be quite different. In acute thyrotoxicosis the most obvious sign is

the lid retraction which can vary from day to day. The exophthalmos is more apparent than real and in early stages responds to prostigmine. The patient may have levator impairment and weakness of convergence; the eyeball can easily be pressed into the orbit.

In malignant exophthalmos, on the other hand, the lid retraction does not vary and is accompanied by impairment of levator action. The exophthalmos may remain unilateral for years and is never compressible. It is accompanied by edema and chemosis of the surrounding orbital tissues. This infiltration of tissues may result in the development of scotoma. Careful irradiation of the orbit may be an effective treatment of the malignant exophthalmos. (5 figures, 10 references)

Morris Kaplan.

Verzella, Mario. **Intrascleral implant of acrylic sphere with metallic stem.** Rassegna ital. d'ottal. **26**:246-264, July-Aug., 1957.

After discussing various techniques and the material used in evisceration of the globe the author presents his own. It consists of an incision in the sclera, 2 mm. above the limbus, evisceration of the globe, and implantation of a 9 to 10 mm. acrylic sphere with a metal pivot attached on the posterior surface. The method is similar to that of Burch. (9 figures, 24 references) Eugene M. Blake.

15

EYELIDS, LACRIMAL APPARATUS

Beard, C. **Annual review: lids, lacrimal apparatus, and conjunctiva.** A.M.A. Arch. Ophth. **59**:121-144, Jan., 1958.

The pertinent literature appearing in the year 1957 is abstracted. (171 references) Edward J. Swets.

Katavisto, Martti. **Dacryostomies.** Acta ophth. **35**:491-504, 1957.

Epiphora was treated in 365 patients in the course of three years. Simple dacryostenosis existed in 157, dacryophlegmon in 32 and chronic purulent dacryocytitis in 176. Under 20 and above 70 years the proportion of men and women was equal, between 20 and 70 the incidence in women was 84 percent. Dacryocystorhinostomy was performed 85 times in 70 patients (15 bilaterally) aged from five and one half months to 55 years. Ohm's or Dupuy-Dutemps' methods were used. Good results were obtained in 90 percent. After-care is important. X-ray examination is an invaluable aid. The physiologic pumping action of the canaliculi is a prerequisite for success. (7 figures, 4 tables, 32 references)

John J. Stern.

Larsson, S. and Lindgren, S. **Surgical treatment of congenital atresia of the nasolacrimal duct.** Acta ophth. **35**:411-415, 1957.

In 17 of 66 cases of congenital atresia of the nasolacrimal duct repeated probings were without effect. In all these cases the endonasal operation described by Larsson in 1938 proved successful. (1 figure, 1 table, 10 references) John J. Stern.

Sokolic, Petar. **The dosage of advancement of the levator in the operation for ptosis of Blaskovics.** Acta ophth. **35**:401-405, 1957.

The last steps of the operation are performed from the outside. The lid margin is retracted to the desired position and the anterior layers of the lid are attached by the sutures to the levator. The sutures forming the superciliary furrow are also inserted from the outside. (5 figures 2 references) John J. Stern.

16

TUMORS

Bello, Domenico. **Facial angioma and glaucoma.** Rassegna ital. d'ottal. **26**:299-309, July-Aug., 1957.

The various forms of encephalofacial angiomatosis are reviewed and an example of this disease in a 75-year-old man is reported. Chronic simple glaucoma without increase in the size of the globe appeared three years later. No neuropsychodynamic changes or osseous defects were noted. It is thought that the glaucoma developed because of altered secretion from choroidal angiomatosis. (5 figures, 52 references) Eugene M. Blake.

Colombi, Carlo. **Subconjunctival lipoma.** Rassegna ital. d'ottal. **26**:389-396, Sept.-Oct., 1957.

A mass of fatty tissue was noted in the upper temporal portion of each orbit in a 69-year-old woman for six years and was increasing in size. During surgical removal the mass, a lipoma, was found to be adherent to the lateral rectus muscle. (7 figures) Eugene M. Blake.

Pagani, Luciano. **Ocular plasmocytoma.** Rassegna ital. d'ottal. **26**:364-375, Sept.-Oct., 1957.

This infrequent condition known as multiple myeloma and plasma cell myeloma occasionally involves the eyes. The disease occurs in diverse forms from apparently benign forms to malignancy, and is widely scattered or closely confined. The most frequent evidence of the disease is exophthalmos, which may show extension to the brain or to the retina, and even cornea, conjunctiva, caruncle and the lacrymal passages are involved at times. A case is reported in a 61-year-old man whose symptoms began as chest pains and later extended to the orbit. This is the fifth case in the literature of plasmocytoma of the orbit. The physical and laboratory findings are described. (1 figure, 53 references) Eugene M. Blake.

17
INJURIES

Appelmans, M., Michiels, J. and Françoisse, J. **Ocular chalcosis.** Bull. Soc. belge d'opht. **116**:402-410, 1957.

Very small intraocular copper particles are sometimes fairly well tolerated but might cause ocular chalcosis because of diffusion and chemical reactions. A patient was seen when he was 12 years old, immediately after an injury by an exploding detonator. The ocular performation was never seen, not even on the day of accident, and repeated X-ray films were negative. Eleven years later the eye showed all the characteristic effects of an intraocular copper particle: deposition of copper salts in Descemets zone, sunflower cataract, destruction of the vitreous tissue, heavy granular deposits in the anterior parts of the vitreous, and several glittering, sharply outlined retinal lesions. The function of the eye was remarkably good. The difficulties and hazards of initial and late treatment are emphasized. The dangers in removal of copper from an eye, except from the anterior chamber, are emphasized. A copper particle should always be removed from the anterior chamber. Injections of sodium hyposulphite and of B.A.L. were tried in animal chalcosis and are not recommended. (3 figures, 25 references)
Alice R. Deutsch.

Czukrasz, Ida. **Subconjunctival novocain injections in cauterizing injuries of the eye.** Arch. f. Ophth. **159**:560-568, 1958.

The author reports 11 patients with burns of a moderate degree by lime and other cauterizing agents which were improved by subconjunctival injections of 2-percent novocain. (1 table, 10 references) Ernst Schmerl.

Lemoine, Albert N., Jr. **Emergency treatment of eye injuries.** J. Iowa St. Med. Soc. **48**:728-732, Dec., 1957.

The emergency treatment of foreign bodies, abrasions and lacerations, contusions and burns of the eye are well dis-

cussed. The findings, pathology, treatment, and complications are directed at the general practitioner. (1 figure)

Irwin E. Gaynon.

Sautter, H. **Eye injuries and their management.** Deutsche med. Wchnschr. **82**: 2110-2112, Dec. 13, 1957.

Trauma to the eye and adnexa is discussed for the general physician. The treatment of chemical burns from acids, alkalies, and dyes is detailed and milk is recommended as the best emergency eye wash because of its amphoteric reaction. The author uses a dental burr for removal of rust rings of the cornea and describes the handling of sharp and blunt injuries to the globe, including perforations and intraocular foreign bodies.

Edward U. Murphy.

Schenk, H. and Nemetz, U. R. **The result of 193 intraocular foreign bodies extracted with a magnet.** Klin. Monatsbl. f. Augenh. **132**:71-77, 1958.

The authors compare 88 cases cared for between 1930 and 1939 and in which a foreign body was extracted with a giant magnet via the anterior route, with 105 cases in which a hand magnet was used via the diascleral route between 1946 and 1955. The occurrence of infection (seven cases) was the same in both series. Atrophy of the globe and retinal detachment occurred more frequently in the early series. Traumatic cataract was also more common in the first group. (4 tables, 31 references) Frederick C. Blodi.

Warburg, Mette. **Traumatic blindess in Denmark.** Danish Med. Bull. **5**:35-37, Jan., 1958.

A survey is given of the number of traumatically blinded during the past fifty years in Denmark and of the circumstances leading to the accident. The incidence of traumatic blindness in children and of sympathetic ophthalmia is decreasing. (7 tables, 6 references)

Irwin E. Gaynon.

18

SYSTEMIC DISEASE AND PARASITES

Adams, A. R. D., Woodruff, A. W., Bell, S. and Schofield, F. D., Hawking, F., Choyce, D. P., and Kershaw, W. E. **Symposium on onchocerciasis.** Roy. Soc. Trop. Med. & Hyg. **52**:95-127, March, 1958.

In five separate discussions the authors summarize all important data and concepts related to onchocerciasis.

Adams, A. R. D. Introduction. pp. 95-96.

Woodruff, A. W., Bell, S. and Schofield, F. D. Clinical diagnostic and therapeutic aspects of onchoceriasis. pp. 97-108.

Hawking, Frank, Chemotherapy of onchocerciasis. pp. 109-111.

Choyce, D. P. Some observations on the ocular complications of onchocerciasis and their relationship to blindness. pp. 112-121.

Kershaw, W. E. Relation between infection with Onchocerca volvulus and eye-lesions. pp. 122-127.

It is striking that Europeans are especially susceptible to invasion of the eye in onchocerciasis in Africa and South America, whereas the incidence of eye lesions in the permanent residents with prolonged and heavy infection is low.

F. H. Haessler.

Cremona, A., Grassi, M. and Gastaldi, T. **Sarcoidosis.** Arch. oftal. Buenos Aires **32**:279-290, Oct., 1957.

After presenting a comprehensive review of most pertinent literature, the authors report four cases of sarcoidosis in which there existed bilaterally a severe granulomatous uveitis. In all of them vision was markedly impaired, and in three the diagnosis could be established histologically. (83 references)

A. Urrets-Zavalía, Jr.

François, J., Hoffmann, G., Verriest, G. and Candaele, N. **Nocardiosis with pulmonary, intracranial and orbital localization.** Acta ophth. **35**:469-477, 1957.

A man, aged 27 years, presented a pulmonary cavernous formation and a lesion in the right frontal lobe, extending into the orbit and the lacrimal gland. Puncture of the latter enabled the identification of Nocardia asteroides. Excision of the affected cerebral and orbital tissues and intensive sulfadiazine and chloromycetin therapy were followed by cure. (9 figures, 19 references) John J. Stern.

Galvez Montes, J. **Intraocular lesions caused by ascarides.** Arch. Soc. oftal. hispano-am. **17**:1377-1381, Dec., 1957.

The literature is reviewed and two cases of ocular disease caused by this parasite reported. One had retinal periphlebitis with recurrent vitreous hemorrhages, and the other had a central chorioretinitis. The periphlebitis is attributed to an allergic mechanism, while the choroiretinitis is believed to be caused by a direct action of the larvae of the parasite. Antiparasitic therapy arrested the process in both cases. (8 references)

Ray K. Daily.

Jensen, Vagn J. **Gargoylism in two brothers.** Acta ophth. **35**:550-555, 1957.

Gargoylism and its eye changes are discussed briefly, and its occurrence in two brothers is described. In addition to the characteristic corneal changes, one of the patients presented elevation of the ocular tension. (1 figure, 23 references)

John J. Stern.

Lagraulet, J., Le Breton, G. and Rit. **Histologic lesions of the posterior segment in a case of ocular onchocerciasis.** Soc. Path. Exotique Bull. **50**:364-372, May-June, 1957.

The chorioretinal lesions of onchocerciasis may be found without the presence of microfilariae inside the eye. The living organism is tolerated intraocularly without signs of irritation. A toxin is liberated by dead microfilariae or involuting cysts in or near the external coats of the eye and has an effect on the posterior segment through the blood vessels. One eye is described histologically and three eyes previously examined are discussed from this standpoint. The use of a substance to neutralize the toxin is suggested in addition to a filaricide. Edward U. Murphy.

Oksala, Arro. **Intravascular aggregation of erythrocytes in some eye diseases.** Acta ophth. **35**:393-400, 1957.

Aggregation (sludging) of erythrocytes was studied in 50 patients with various conditions in only one eye. Thirteen of them showed the phenomenon, and it was similar in both eyes. Its occurrence and degree paralleled the sedimentation rate values. Eye disease alone does not usually produce aggregation, but conditions which should be interpreted as involving the whole organism, such as iritis and uveitis, are more frequent among patients with high sedimentation rate and aggregation. Of 19 patients who were also examined for the occurrence of erythroglobulinemia, a positive result was obtained in three with acute iritis, chronic uveitis, or rubeosis iridis. The latter was the only one who also showed aggregation. Aggregation does not have a noxious influence on the healthy eye, but in the affected eye it may aggravate the disease by reducing fluid circulation and increasing hypoxia. (1 table, 14 references)

John J. Stern.

Rubio, J., Cassanovas, J. and Nadal Abella, J. **Clinical aspects of leprosy.** Arch. Soc. oftal. hispano-am. **18**:118-137, Feb., 1958.

Thirteen cases of ocular leprosy from the leprosarium in San Lazaro are briefly reported. All 27 patients in the lepro-

sarium were gravely ill with frequent febrile episodes. Of the 27 patients 13 were men of whom eight had ocular lesions and 14 were women of whom five had ocular lesions. The ocular lesions, the diagnosis, and treatment of the ocular lesions as well as the general treatment of leprosy are thoroughly reviewed. (8 figures, 50 references) Ray K. Daily.

19

CONGENITAL DEFORMITIES, HEREDITY

Boder, E. and Sedgwick, R. P. **Ataxia-telangiectasia: a familial syndrome of progressive cerebellar ataxia, oculocutaneous telangiectasia and frequent pulmonary infection.** Pediatrics **21**:526-554, April, 1958.

The authors report clinical observations of this syndrome in eight patients and also autopsy findings in one. Progressive telangiectasia of the bulbar conjunctiva is its most striking identifying sign. (8 figures, 1 chart, 3 tables, 28 references) F. H. Haessler.

Colombi, C. and De Sario, P. N. **Pathogenetic considerations in a case of microophthalmos with a congenital cardiopathy, cleft palate, and colomboma and cyst of the eyelid.** Rassegna ital. d'ottal. **26**:411-428, Nov.-Dec., 1957.

A girl born at full term presented these various defects of unknown cause. The only possible etiologic factor was the use of iodine by the mother during pregnancy. All pertinent considerations are extensively discussed. (7 figures, 60 references) Eugene M. Blake.

François, J. **Heredity in ophthalmology.** Bull. Soc. belge d'opht. **118**:1-300, 1958.

This monograph represents a most valuable contribution to a difficult subject whose many implications and extensions are ascertained and appraised. Only a short preface is devoted to generalities. Phenotypy was defined as the result and summary of visible characteristics common to the individual as a member of the species, alike by appearance but unlike by heredity. Phenocopy, at the other hand, is the sum total of bodily changes only resembling mutations but actually caused by dissimilar exogenous factors not transmitted by heredity. Many congenital malformations therefore are not genetic but determined by various noxious elements such as German measles, and diverse metabolic, circulatory and traumatic disturbances. The penetration and expression of a gene may vary from 0 to 100 percent. The penetration of a gene demonstrates the actual occurrence of the phenotypic manifestation while the expressiveness of a gene reveals the degree of the phenotypic manifestation. The heterozygous gene always incites abnormal clinical manifestations which are more serious than those caused by homozygous genes. This is why recessive abnormalities often are much more disastrous than dominant aberrations. There is very little fundamental difference between the different modes of heredity. The heredity is recessive in the presence of a weak penetration and expressiveness; the heredity is dominant whenever both penetration and expressiveness are strong. Abnormal patterns may follow one or the other mode. This fact is of great importance for the genetic evaluation of the individual case because the penetration of an abnormal gene rarely varies too much in a given family. These factors also should determine and disclose eventual heterozygotes in the presence of an incomplete penetration.

The main part of this "report" contains a well documented but necessarily limited summary of the existing information on hereditary ocular anomalies. The first part in 18 chapters, includes a systematic, detailed report on diverse but strictly ocular diseases. Abnormalities of the lids, of the orbits and their adnexa, abnormalities

of the position and motility of the eyeballs and abnormalities of the anterior and posterior segments are discussed in successive chapters. Special chapters deal with functional aberrations of the retina, namely, to the diverse forms of hemeralopia and dyschromatopsia. The multiple optical factors and their many possible variations and combinations which constitute the individual refraction of a given eye, are analyzed. It is emphasized that a correct interpretation of the genetic factors of the total refraction inevitably calls for knowledge of the heredity of each single optical factor and of the corresponding relationships to the physiologic variations of ametropias.

The second part is composed of eight chapters. Systemic diseases and their relation to abnormal ocular signs and symptoms are the specific topic. Metabolic diseases, diseases of the nervous system, of the skeleton, of the skin, of the blood and circulatory system are each covered in a separate chapter. The last chapter deals with several clinical syndromes which are divided, depending on their origin, into the mesodermal, the ectodermal and the essential neuro-ectodermal syndromes.

Alice R. Deutsch.

Garzino, Alessandro. **Familial ptosis and external ophthalmoplegia in the fifth generation.** Rassegna ital. d'ottal. **26**:436-447, Nov.-Dec., 1957.

Tirelli described a family of four generations with congenital palpebral ptosis and external ophthalmoplegia. Since Tirelli's report 22 years ago, four more individuals with these stigmata have been born to this family. Two of them are in the fourth generation and are described. In the fifth generation there are 10 offspring of whom two boys, aged four and six years, carry the stigmata. There was complete paralysis of all the extraocular muscles in each child. Because of divergence of the eyes, surgery was performed and muscle tissue was excised for study. There was marked underdevelopment of the muscle fibers, and excess of connective tissue in the rectus muscles, and complete absence of muscle fibers in the superior rectus. The heredity in these cases is dominant except for a report in the literature of a family in which the heredity was recessive. (1 figure, 30 references) Eugene M. Blake.

Jefferson, M. and Rutter, M. L. **A report of two cases of the juvenile form of amaurotic familial idiocy (cerebromacular degeneration).** J. Neurol., Neurosurg. & Psychiat. **21**:31-37, Feb., 1958.

Two cases of juvenile familial amaurotic idiocy are presented in siblings. There was evidence of lipid disturbances in the long bones and spine, Cushing's syndrome, and raised serum gamma globulin in each. (8 figures, 35 references) Irwin E. Gaynon.

Mannkopf, H. and Hanney, F. **Congenital ectodermal dysplasia.** Arch. f. Ophth. **159**:643-661, 1958.

Seven children are described who exhibited the numerous manifestations of congenital ectodermic dysplasias. The rarety of associated malformations, deformities of the nasolacrimal ducts and pili torti, is emphasized. In one of the children the simultaneous occurrence of manifestations suggesting dysostosis cleidocranialis was combined with ectodermal dysplasia. Aside from the demonstrable dominant pattern of inheritance the possibility of a peristatic phaenocopy must be recognized. (10 figures, 21 references) F. H. Haessler.

Reed, H. and Grant, W. **Möbius's syndrome.** Brit. J. Ophth. **41**:731-739, Dec., 1957.

Möbius syndrome has also been known

as congenital facial diplegia; congenital oculofacial paralysis, nuclear agenesis and congenital nuclear aplasia. It is relatively uncommon and presents a bizarre group of symptoms which include 1. bilateral facial palsey which differs from the usual in that there is no wasting of the facial tissues but the face becomes and remains expressionless, 2. absence of abduction of either eye beyond the midline, 3. defective convergence, 4. normal vertical movements, 5. convergent strabismus, 6. affection of other cranial nerves, particularly the hypoglossal, 7. other developmental anomalies and 8. mental deficiency. Three rather typical cases are described. In all there were mild irregularities early in pregnancy. The disease is most probably due to a toxic effect on the development of the affected cranial nerve nuclei of the fetus in the early period of pregnancy, probably the fourth or fifth week. (3 figures, 34 references) Morris Kaplan.

Shaw, D. A. and Duncun, L. J. P. **Optic atrophy and nerve deafness in diabetes mellitus.** J. Neurol., Neurosurg. & Psychiat. **21**:47-49, Feb., 1958.

Three members of a family are described in whom the early coexistence of diabetes mellitus, optic atrophy, and bilateral nerve deafness is encountered. The possibility of a new and unrecorded genetic syndrome is discussed. (9 references) Irwin E. Gaynon.

Viefhues, Theo Karl. **Unilateral aplasia of the macula, myopia, and myelinated nerve fibers in one of identical twins.** Klin. Monatsbl. f. Augenh. **132**:104-106, 1958.

These anomalies were found in the left eye of an 11-year-old boy. His twin brother had normal eyes. (3 figures, 1 table, 15 references) Frederick C. Blodi.

20

HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Bledsoe, C. W. **Rehabilitation of the blind geriatric patient.** Geriatrics **13**:91-96, Feb., 1958.

The author discusses the personal problems of the blind geriatric patient and of those about to be blind. He makes clear the need for understanding management in a variety of situations. (3 references) F. H. Haessler.

Law, F. W. **Needless loss of vision: its prevention.** Canad. M. A. J. **78**:1-5, Jan. 1, 1958.

This is a discussion of the eye conditions which in some way may be prevented or improved if proper measures are taken by the general physician. Antisepsis, restriction of oxygen in prematures, eugenics, education of the patient, and prevention of injury are some of the means advocated. Edward U. Murphy.

Stolfi, Angelo Vito. **The actual state of endemic trachoma in the city of Potenza.** Arch. di ottal. **61**:401-410, Sept.-Oct., 1957.

The author conducted a survey on the incidence of trachoma in the city of Potenza. He found 18 families, numbering in all 88 persons, 61 of whom were trachomatous. In 1946 there had been 168 cases in the city. The improvement was attributed to better general physical living conditions, reduced transcient population, and better hygiene. (1 table, 11 references) Paul W. Miles.

Tretakoff, M. I. and Farrell, M. J. **Developing a curriculum for the blind retarded.** Am. J. Deficiency **61**:610-615, Jan., 1958.

The authors suggest means of educating the blind retarded. (5 references) Irwin E. Gaynon.

NEWS ITEMS

EDITED BY DONALD J. LYLE, M.D.
411 Oak Street, Cincinnati 19, Ohio

News items should reach the editor by the 10th of the month. For adequate publicity, notice of postgraduate courses and meetings should be received three months in advance.

DEATHS

Dr. John Hollis Matheson, Des Moines, Iowa, died March 11, 1958, aged 53 years.

ANNOUNCEMENTS

STANFORD UNIVERSITY COURSE

The faculty of the Division of Ophthalmology, Stanford University School of Medicine, announces a new course on "The causes of failure in intraocular surgery and related problems." The course will be presented November 12 through November 15, 1958. The $75.00 fee well include lunches and a dinner. Enrollment will be limited to 30 ophthalmologists. Those interested should contact:

Office of the Dean
Stanford University School of Medicine
2398 Sacramento Street
San Francisco 15, California.

POSTGRADUATE CONFERENCE IN STRABISMUS

Stanford University School of Medicine (Division of Ophthalmology) will present a course in strabismus consisting of lectures, demonstrations, and seminars from Wednesday, August 27, through Saturday, August 30, 1958. Enrollment will be limited.

Instructors will be Dr. Maynard C. Wheeler (Columbia University College of Physicians and Surgeons), Dr. Edward Tamler, and Dr. Arthur Jampolsky.

Programs and further information may be obtained from:

Office of the Dean
Stanford University School of Medicine
2398 Sacramento Street
San Francisco 15, California.

MISCELLANEOUS

SPRING CONGRESS

At the Gill Memorial Eye, Ear, and Throat Hospital 31st annual spring congress in ophthalmology and otolaryngology, 43 states were represented as well as different parts of Canada. A total of 350 doctors and their wives and 21 guest speakers attended. The 32nd annual spring congress will be held from April 6 through April 11, 1959.

SOCIETIES

BROOKLYN SOCIETY

The 148th regular meeting of the Brooklyn Ophthalmological Society was held at the Brooklyn Eye and Ear Hospital. Following an informal examination and discussion of interesting cases and the presentation of case abstracts, the following papers were presented:

"Osteogenesis imperfecta," Augusto Kohtiao, with discussion by Martin Bodian; "Retinal detachment in aphakic eyes," Gerald Blumenthal, with discussion by Leonard Posner; "The evisceration of the eye," Anthony Pirundini, with a discussion written by Richard C. Troutman and read by Austin Fink; "Lymphosarcoma of the lacrimal gland," Douglas Williamson, with discussion by A. Benedict Rizzuti. Dr. Thomas Black-Kelly of Hereford, England, read by invitation a paper entitled, "Igni puncture in glaucoma."

HISPANO-AMERICANA

The 35th congress of the Hispano-Americana Ophthalmological Society will be held in San Sebastian, Spain, September 16 to 20, 1958.

CHICAGO SOCIETY

Officers-elect of the Chicago Ophthalmological Society are: President, J. Vernal Cassady, South Bend, Indiana; president-elect, Clifford Sullivan, Chicago; vice-president, Manuel L. Stillerman, Chicago; secretary-treasurer, Joseph S. Haas, Chicago; councilor, Theodore N. Zekman, Chicago; recording secretary, David Shoch, Chicago.

WEST VIRGINIA ACADEMY

The West Virginia Academy of Ophthalmology and Otolaryngology held its 11th regular meeting recently at the Greenbrier, White Sulphur Springs, West Virginia.

AOS OFFICERS

At its recent meeting, the American Ophthalmological Society elected the following officers for the coming year: President, Dr. Derrick Vail, Chicago; vice-president, Dr. Algernon B. Reese, New York; secretary-treasurer, Dr. Maynard C. Wheeler, New York; editor, Dr. Gordon M. Bruce, New York.

NEW YORK OFFICERS

The officers of the New York Society for Clinical Ophthalmology for the 1958-1959 season are: President, Dr. Arthur Linksz; vice-president, Dr. Joseph Laval; recording secretary, Dr. Alan H. Barnert;

corresponding secretary, Dr. Leon H. Ehrlich; treasurer, Dr. Henry M. Kera; historian, Dr. Robert S. Coles. Committee chairmen: program, Dr. Abraham Schlossman, instruction session, Dr. Alfred Kestenbaum; legislative, Dr. Benjamin Rosenthal; membership, Dr. Howard Agatston; industrial, Dr. Edward M. Douglas. Dr. Harvey E. Thorpe, the retiring president, was elected to the advisory council.

New Mexico meeting

The 1958 annual meeting of the New Mexico Ophthalmological Society was held in conjunction with that of the New Mexico Medical Society at Albuquerque. Dr. Alston Callahan, Birmingham, Alabama, was guest speaker. The society sponsored and manned the exhibit of the National Society for the Prevention of Blindness at which tonometry was performed on some of the physicians attending the general meeting.

Symposium on cataract

The University of Colorado School of Medicine and the Colorado Ophthalmological Society are cosponsoring a symposium on cataract at the postgraduate course in ophthalmology and the summer convention of the Colorado society at Denver, July 21st through 24th. Among the speakers are: Jerome W. Bettman, Frederick R. Carriker, Jose A. Quiroz, Jack S. Guyton, and John C. Long.

Oregon officers

New officers elected by the Oregon Academy of Ophthalmology and Otolaryngology are: President, Dr. David D. DeWeese, 1216 S.W. Yamhill Street, Portland 5; secretary-treasurer, Dr. Paul B. Myers, 223 Medical-Dental Building, Portland 5. The academy meets on the fourth Tuesday of each month from September through May at the Henry Thiele restaurant, 23rd and West Burnside, Portland.

Joint meeting

The next joint annual meeting of the North Carolina Eye, Ear, Nose, and Throat Society and the South Carolina Society of Ophthalmology and Otolaryngology will be held in Asheville, North Carolina, on September 14th through 17th (headquarters, Grove Park Inn). The following guest ophthalmologists will be present: Dr. James A. C. Wadsworth, New York; Dr. Arthur Gerard DeVoe, New York; and Dr. Frank B. Costenbader, Washington, D.C. Guest otolaryngologists will be: Dr. F. W. Davidson, Danville, Pennsylvania; and Dr. Tom Rambo, New York. Anyone wishing any information should write to:

Dr. George Noel
Cabarrus Bank Building
Kannapolis, North Carolina

or

Dr. Roderick Macdonald
330 East Main Street
Rock Hill, South Carolina

Personals

Dr. Frank Walsh has just been promoted to the academic rank of professor of ophthalmology, effective July 1, 1958, at The Johns Hopkins University, School of Medicine.

Ira V. Hiscock, Sc.D., chairman of Yale University Department of Public Health, has been elected president of the National Society for the Prevention of Blindness.

Dr. Louis J. Girard, clinical associate professor of ophthalmology, has been named clinical professor and head of the Division of Ophthalmology at Baylor University College of Medicine, Houston, Texas. He succeeds Dr. Everett L. Goar who retired on February 1st after 15 years as professor and chairman. Dr. Goar was named Distinguished Professor Emeritus of Ophthalmology.

Enzymatic Zonulolysis

Keen interest has been aroused among ophthalmic surgeons over the announcement by Dr. Joaquin Barraquer of Barcelona (Enzymatic zonulolysis: Contribution to the surgery of the lens: A preliminary report. Communication presented before the Royal Academy of Medicine, Barcelona, April 8, 1958) of an enzyme which, if injected into the anterior chamber, apparently dissolves the cement substance of the zonular lamellae so that the lens may be removed with ease.

It is obvious that further studies must be undertaken to verify this important discovery. Dr. Richard C. Troutman, Professor of Ophthalmology, State University of New York, 450 Clarkson Avenue, Brooklyn 3, New York, is collecting the experiences of ophthalmic surgeons who are working with this material. If those using it would pass on the information they obtain to Dr. Troutman as soon as possible, an editorial will be prepared for publication in The Journal.

Derrick Vail.

PRESCRIPTION OPTICIANS

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The Uveitis Laboratory, University of California School of Medicine, San Francisco, is interested to obtain freshly enucleated eyes from patients with *all types of uveitis* and other endogenous inflammations. Attempts are being made to isolate etiologic agents from these eyes.

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* * * *

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